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THIS DIGITAL AGE

Our cover story this issue is about setting up your own CNC router in a home workshop.

Who would have thought that such an amazing piece of kit would become available for home workshop use at such an affordable price? It is an incredible asset to a busy home workshop as it can perform many, many tasks that are usually the domain of large carpentry or metalwork businesses. This router works out at about \$1400 all up, not bad eh?

I suppose we shouldn't be surprised; we have been enjoying this glorious digital age for some time now — what do you reckon, 30 years? When I started in this magazine publishing lark back in 1989, it was my introduction to a computer: an Apple Macintosh. It was used for page layout and design, and was just like a typewriter except it stored the words inside the box rather than printing them out onto a piece of paper — what magic is this?

At the time, I presumed that a computer would be used only for commercial purposes; who would have known what was to come — some clever folks, that's for sure.

In those years since then, just look where technology has gone. To me, 30 years seems

a short period for such a huge revolution but some may disagree. The tech in the phone in our pockets truly beggars belief, and it's good just to appreciate what we have now in this age of technology and how much it has aided and improved our lives — and, of course, our shed workshops.

As computers got faster and smarter, their ability to create increased expeditiously at the same rate and that enabled the crazy rate of change, innovation, and growth we have seen in this technology revolution.

What this means in 2022 is demonstrated so well in Nigel Young's article on the \$1400 CNC router set-up. In this strange pandemic world we are living in now, it may be the dawning of yet another new industrial (tech) age. Maybe a time when we return to cottage industries because not only can we now create almost anything at home but it's also somewhat safer to work alone or in small groups and then promote our skills and wares on the greatest technology creation of them all: the Internet.

What a golden age of change and innovation we are experiencing; aren't we lucky! 📱

Greg Vincent
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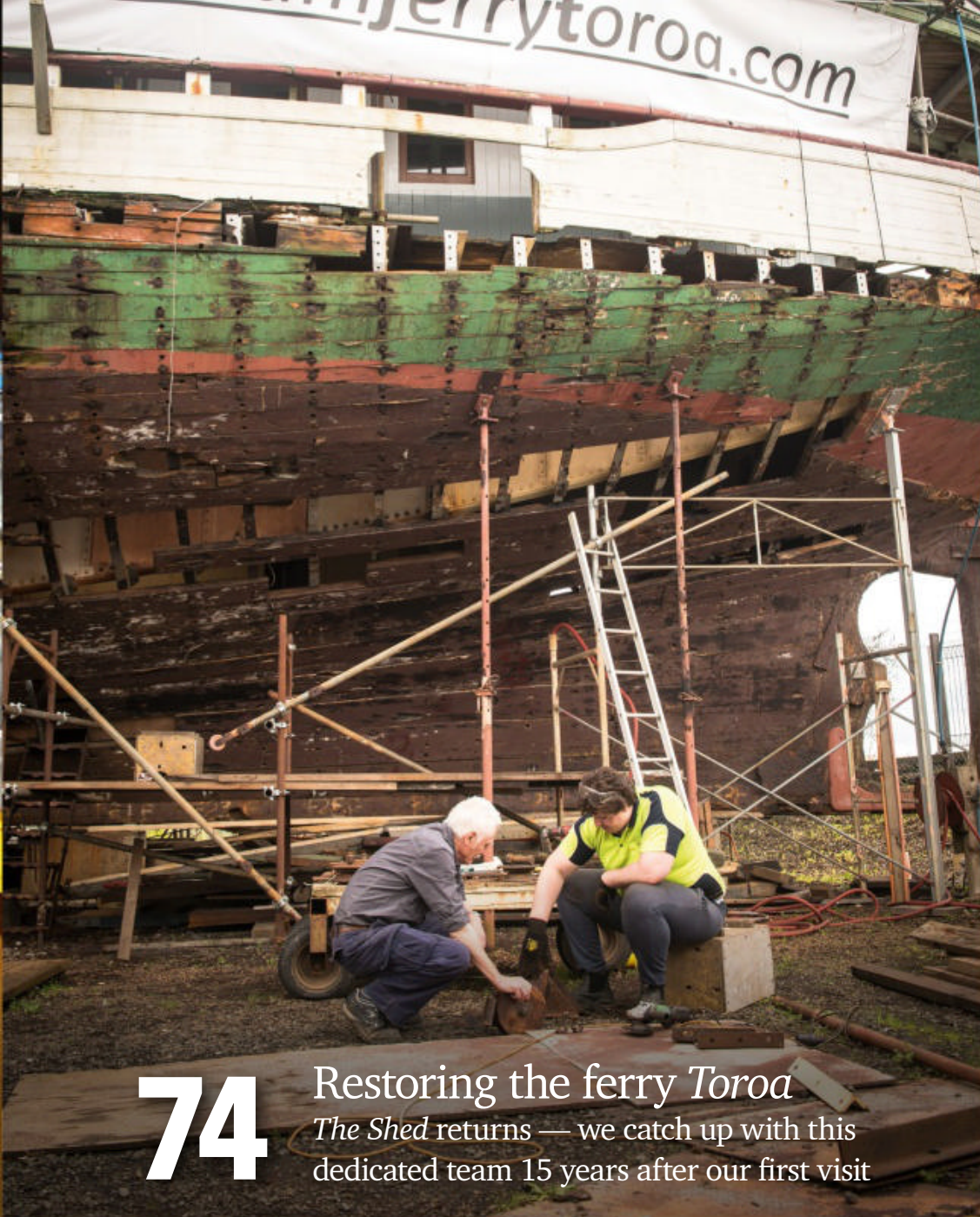
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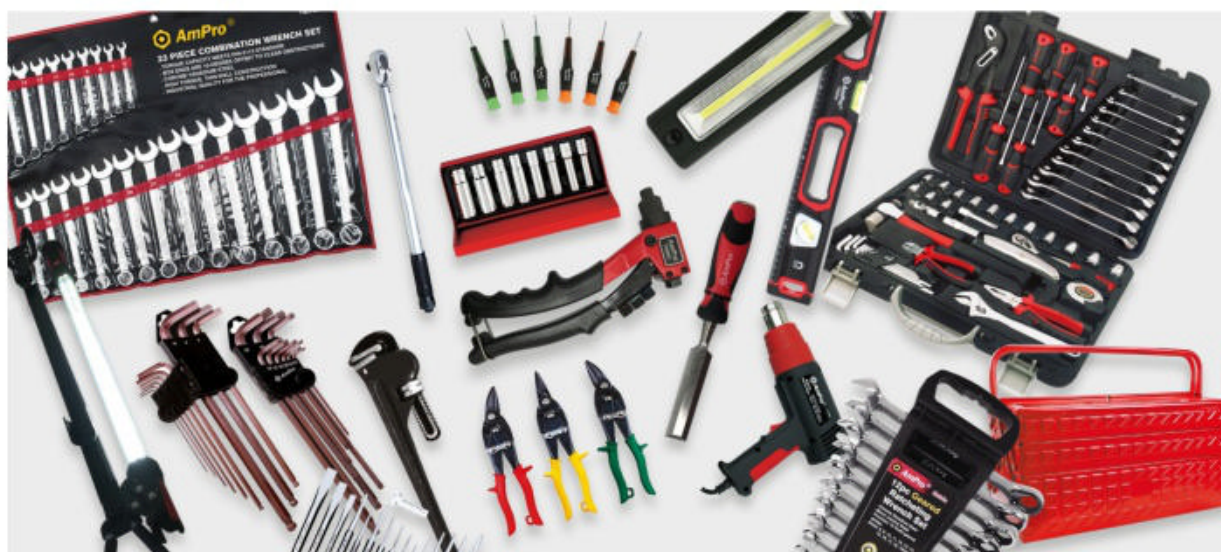
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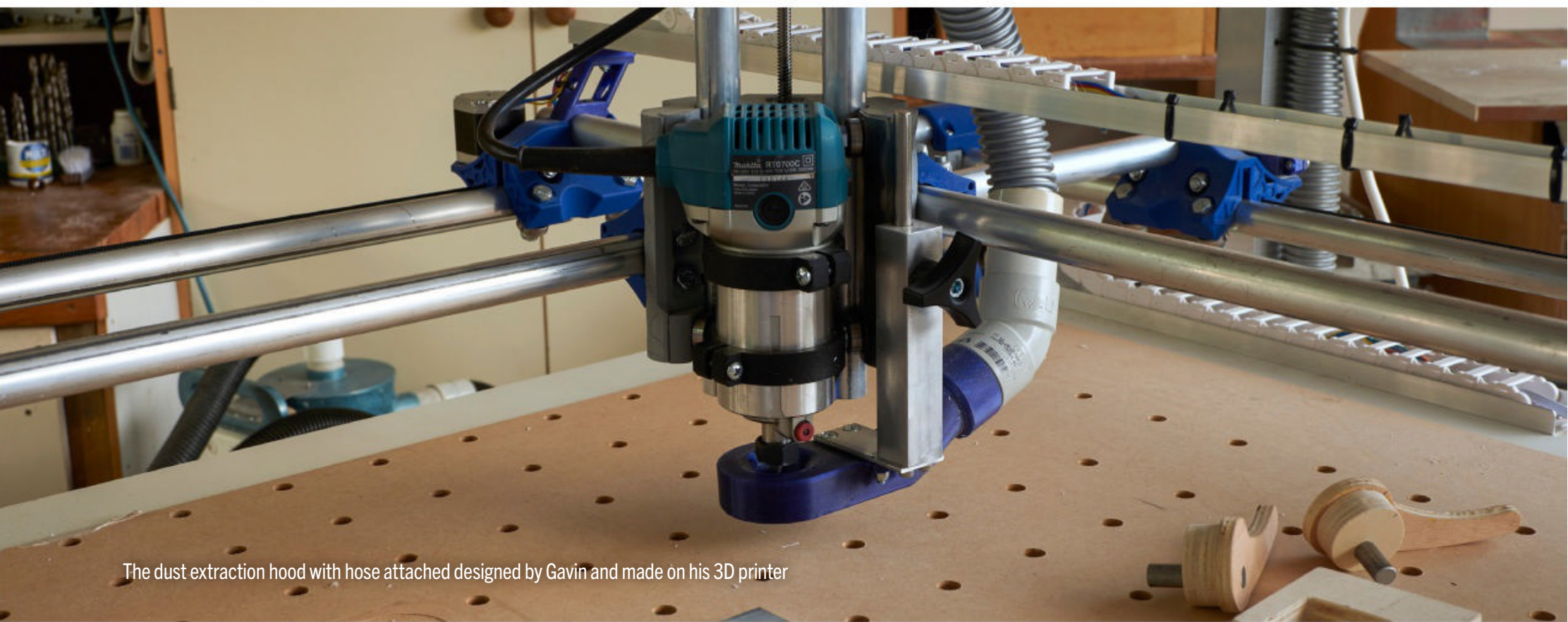
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Des setting the x, y, z co-ordinates for the job



The dust extraction hood with hose attached designed by Gavin and made on his 3D printer

ENTREPRENEURIAL OPPORTUNITIES?

MIGHT THE COVID-GENERATED CHANGE IN ATTITUDES TOWARDS WORKING AT HOME TRIGGER AN INNOVATIVE TYPE OF HOME-BASED INDUSTRY?

By Nigel Young Photographs: Nigel Young and Juliet Nicholas

In these days of Covid and lockdowns, the rise in the number of those working from home has been considerable, to the point at which some businesses are embracing it as a new way of operating.

When we think of home offices, we generally imagine a spare bedroom fitted out for the purpose, because we tend to think of it as a computer workstation, desk-bound office — a scaled-down version of our pre-Covid situation; the one tied to the commute, the bought food and coffees, and the increasingly hard to find car parking spaces.

But what about the garage or shed — what degree of opportunity lies there? This is not an unusual workplace for some — small wooden items cut out with a bandsaw, single items turned on lathes, sophisticated models or patterns and moulds for a production run elsewhere, but each one created by hand as one-offs.

The possibility of taking on an order for 100 and competing with a larger commercial entity has never been a real option without capital and expensive machinery, along with the planning and production lines that accompany such an undertaking. Not to mention the compliance and resource consent issues that it would raise — or that your neighbour would raise.

“In fact, a shed that has them all has the potential to become a hub of innovation, with design and testing processes that were once the domain only of companies with deep pockets”

What if that were all to change — in the manner of the loom in the home that was taken for granted before the industrial revolution? Might there be a 21st century equivalent? Now, the loom was a one-off bespoke production tool — and a manufacturing operation in the middle of the lounge might cause other problems, particularly on the home front — but the principle is the same. Into this space comes the 3D printer, the CNC router, and potentially, the laser cutter. In this article we’re going to concentrate on the CNC router, but it is clear that there is huge opportunity here for those with the entrepreneurial spirit.

Some parallels

It’s easy to see the parallels between 3D printing, CNC routing, and laser cutting, as they all work from a typical CAD x, y, z axis structure, recognise the same .dxf file to begin with, use the same programming code — G-Code

— and accept the same file formats: STereoLithography File (.stl).

Each has helped revolutionise precision-based manufacture at bespoke as well as economic levels of performance. A shed that has them all is as well equipped as larger manufacturing plants were not that many years ago. In fact, a shed that has them all has the potential to become a hub of innovation, with design and testing processes that were once the domain only of companies with deep pockets that could afford the iterative process of product development. I find it fascinating that it is now possible to focus on any item — no matter how insignificant it might seem — and improve on it as the moment sees fit.

Economy of scale

Take the humble cheese slicer, for example. I picked it because these are always breaking. As a designer I had noticed this and had been thinking about it for a while, so when the opportunity to write about the CNC router and the fact that a one-off is effectively as economic to produce as a run of 100 might be, I was in. I say ‘effectively’, as in a commercial situation there will be file download and set-up fees that distort this. However, these are a one-off, and, after they are sorted, they remain on the server waiting to be reused. Economy of scale no longer has the same impact as it really is just as cheap to produce one as it is to produce one 100. The upshot of this, for those who are interested, is that the bespoke is now potentially a commercially viable business model.

The process

Des Thomson’s CNC router kitset, which we are showcasing in this article, was bought from V1 Engineering, while the router is a small hand-held Makita offering. What is particularly interesting is that some of the parts required to set it up were made by the device itself while others were printed using 3D printers, as we shall see.

The kit sits on a tall table on castors, about a metre square, so it is easily stored or repositioned as required. A shelf just above the castors holds the dust extraction cyclone and bucket, making it completely self-contained. A small console accepts an SD card in exactly the same way as a 3D printer does. The only other piece of hardware is an older laptop on which Des has EstlCam, a free G-Code generator, which he uses to prepare the SD card for the console. The item to be produced — in this case, my cheese slicer — had previously been drawn up in iCADMac, a Mac-based alternative to AutoCAD. I exported it as a .dxf file, and, as the file size at 23KB is almost insignificant, I downloaded it onto a USB drive I keep on my key ring and went to see Des. It would have been just as easy to email it, but this is what we did.

“What is particularly interesting is that some of the parts required to set it up were made by the device itself”

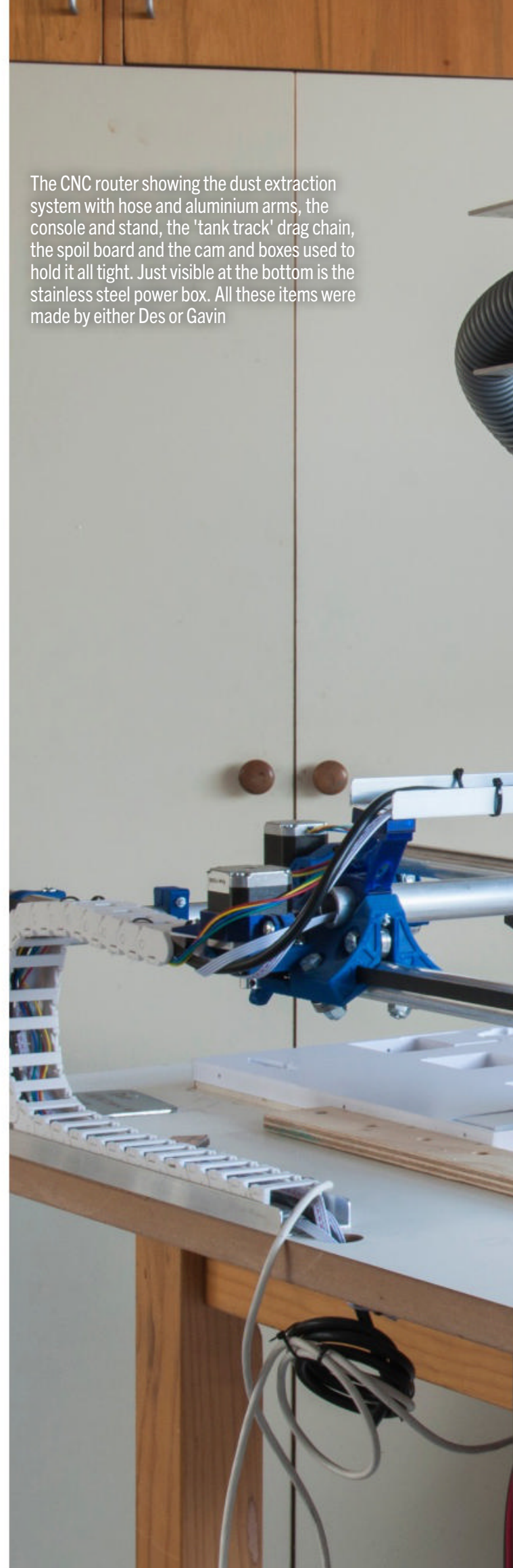
Let’s try it out

Once I arrived, Des set about converting my file to the format the CNC router required. This was a very interesting process, as the final result not only showed the software model the router required, but it also actually emulated the cutting process as it would occur, live. This might be old hat to some, but it was new to me, and I was fascinated by it. The process involved a range of software ‘tools’ to determine the cut variables — depth of cut, width, curve radii, and the like. The path direction is always the same — a point to remember when selecting soft wood, for example. We’ll return to this point later on. The depth needs to be considered carefully, because this is where problems are likely to occur.

There are a number of rules around this aspect:

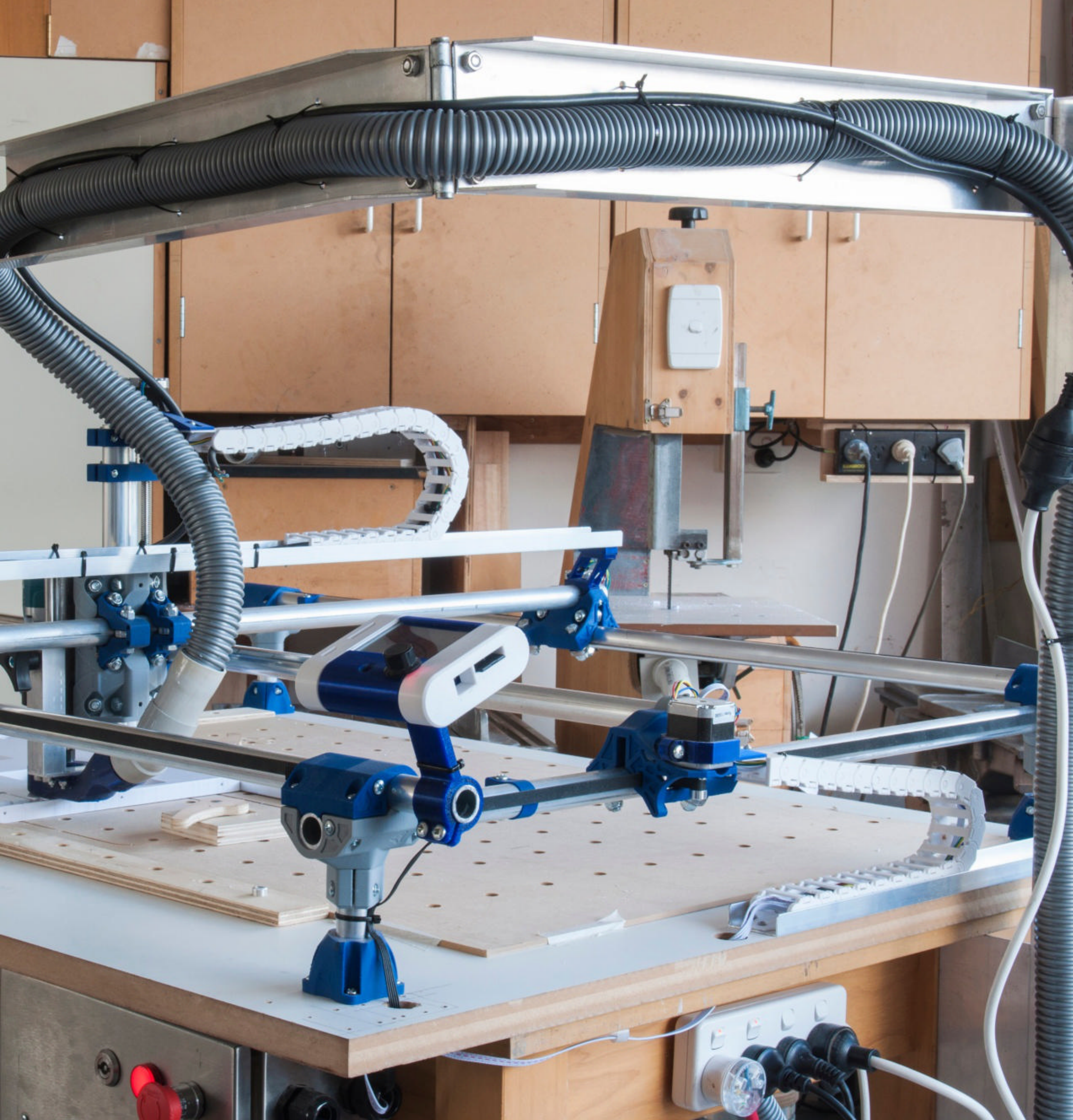
- The depth of the cut should be no more than 50 per cent of the diameter of the cutter, although

The CNC router showing the dust extraction system with hose and aluminium arms, the console and stand, the ‘tank track’ drag chain, the spoil board and the cam and boxes used to hold it all tight. Just visible at the bottom is the stainless steel power box. All these items were made by either Des or Gavin

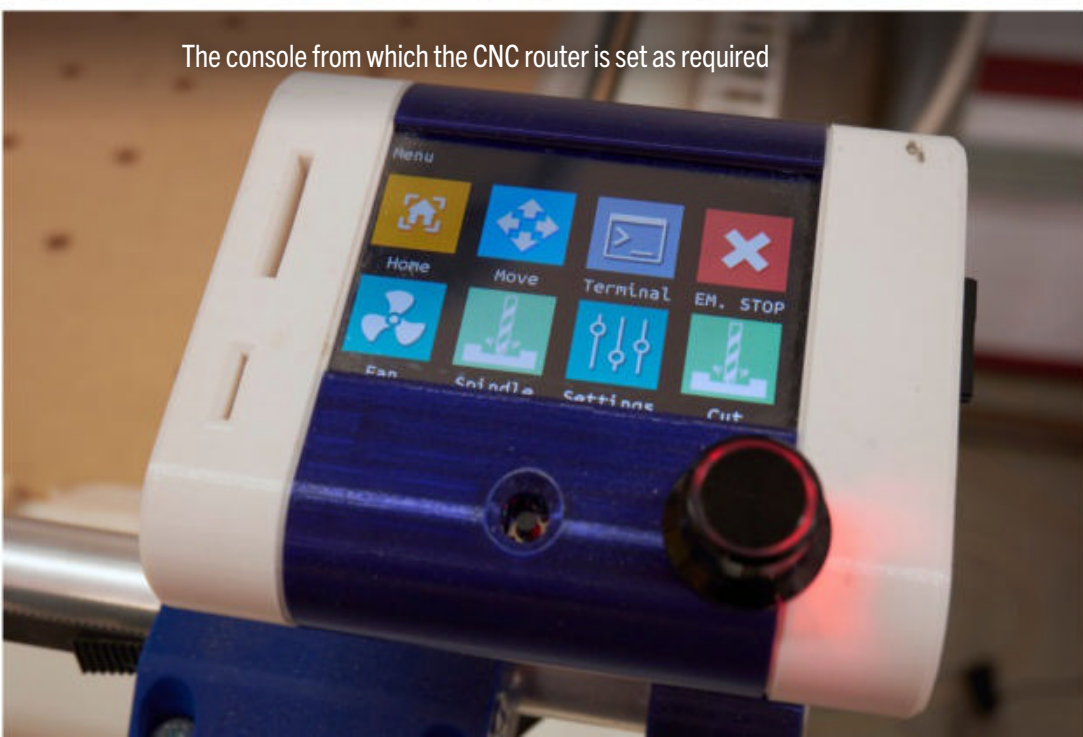


this rule of thumb is also subject to the hardness of the material — the harder the material the shallower the cut is a good maxim to remember.

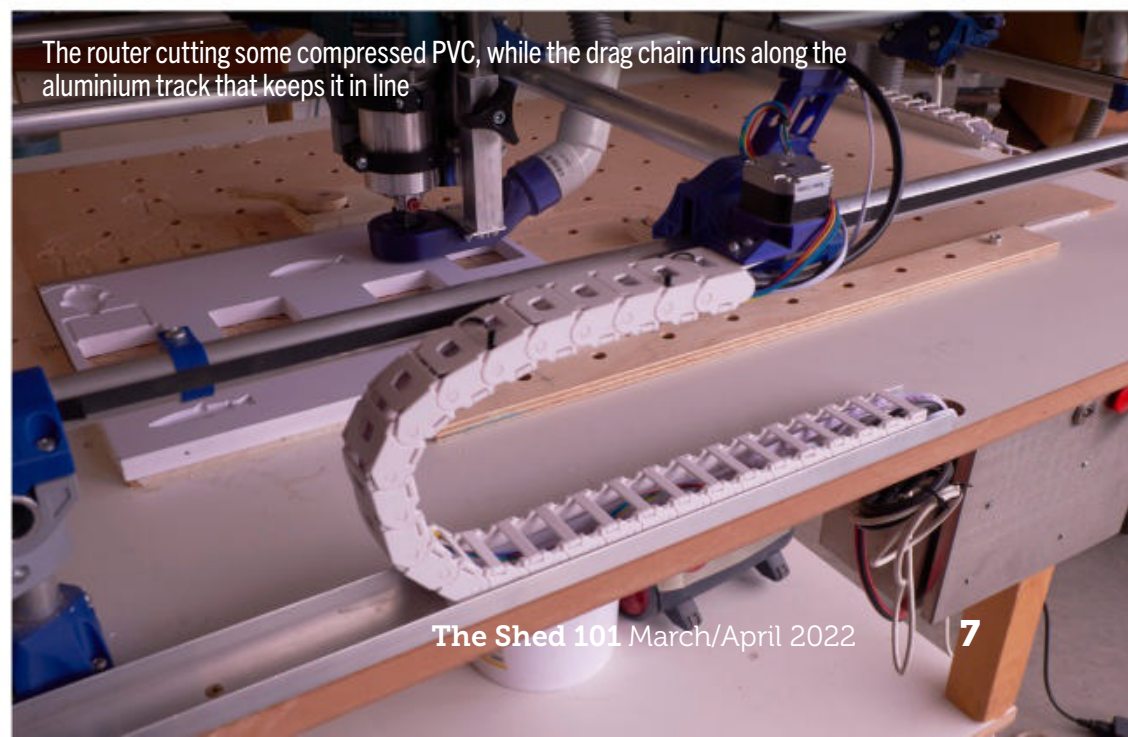
- The depth needs to allow for a cut past the thickness of the material in order to achieve a clean separation. This is done by having a spoil board — in this case a piece of 4mm-deep MDF. ►

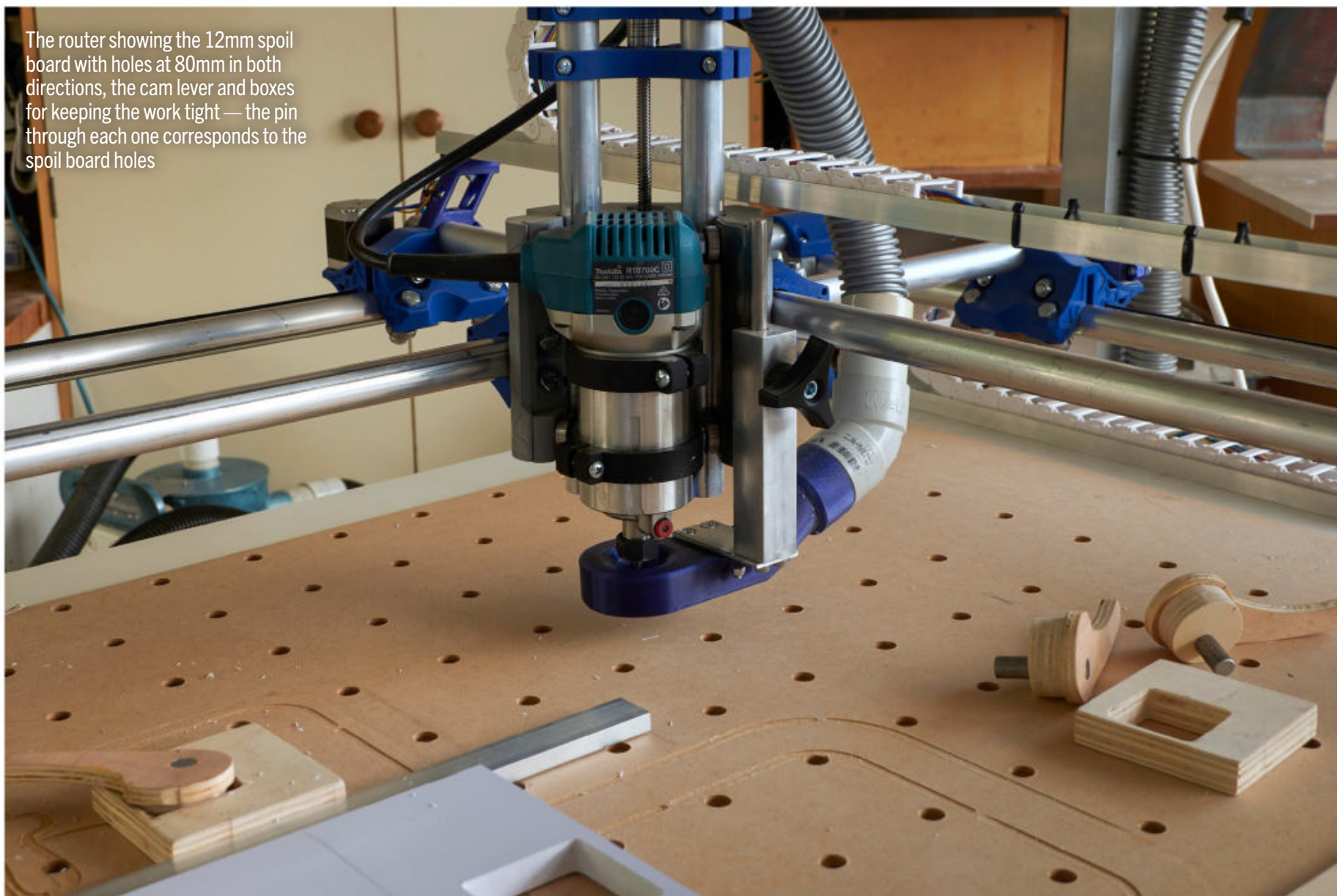


The console from which the CNC router is set as required



The router cutting some compressed PVC, while the drag chain runs along the aluminium track that keeps it in line





The router showing the 12mm spoil board with holes at 80mm in both directions, the cam lever and boxes for keeping the work tight — the pin through each one corresponds to the spoil board holes



The CNC router cutting some compressed PVC. Note the height - the 'z' axis available to the cutter

Making its own parts

This is one example of the CNC router 'making' its own parts, by routing 12mm holes through the spoil board and into a 30mm-deep MDF baseboard beneath. The spoil board is held in

"This might be old hat to some, but it was new to me, and I was fascinated by it"

place with masking tape for ease of replacement as required. At every 80mm in both directions, the holes form a grid across the whole cutting bed. These are then used by small routed-out wooden levers that sit inside offset 'boxes'. Each lever has a steel pin that sits down into the hole. This allows the material — with a packer piece if required — to be tightened, using the cam principle to apply the tension.

Remember to keep the path of the cut in mind when positioning them, as an error here could see the cutter

hitting the cams and upsetting the cut — a situation that is shown in one of the photos.

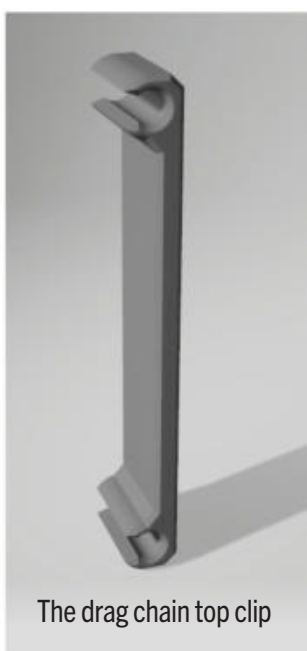
An example of setting the depth of the final cut would be setting it at 13mm to cut through some 12mm compressed PVC — a sample of which can be seen in the photos. This would result in a cut of 1mm into the spoil board — it's the same as, when drilling through a piece of wood, in order to get a good clean hole, you drill through into a second piece below. Des found the .dxf files for the cam levers free online.

User coordinate system

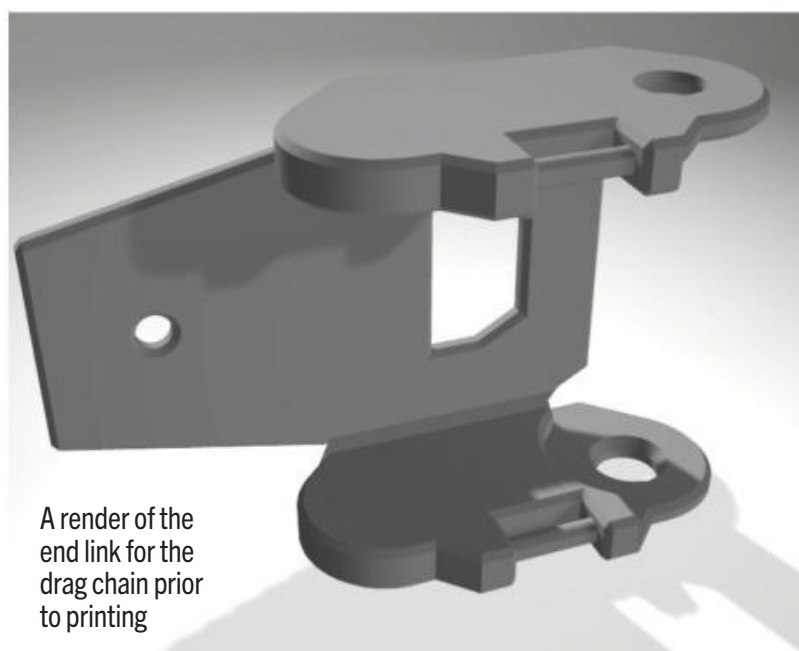
Keep in mind this is 3D cutting — using x, y, and z axes. X and y are both for the lateral positioning of the material on the cutting bed — think back to the maths graphs on the blackboard at school with one up and the other across. The z, on the other hand, is about the vertical axis — the one that controls the correct depth according to the instructions at each point along the path with regard to its position as established by the x and y axes.



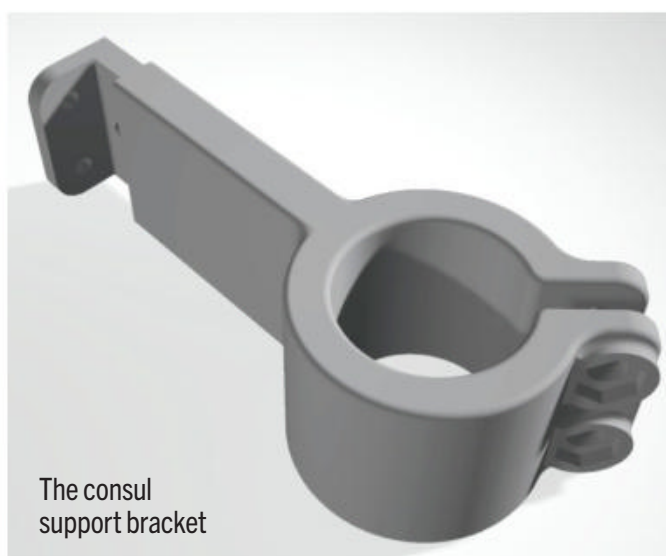
A drag chain link



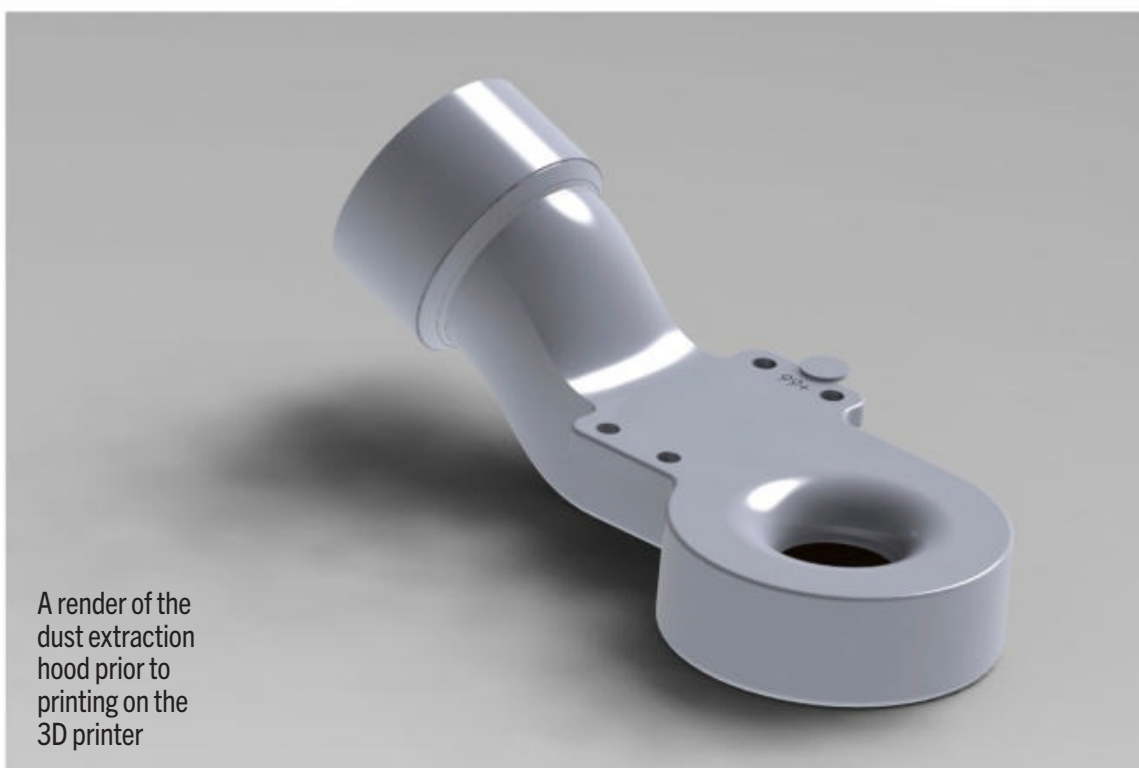
The drag chain top clip



A render of the end link for the drag chain prior to printing



The consul support bracket



A render of the dust extraction hood prior to printing on the 3D printer

In order to achieve this, however, it is important to establish an initial reference point at which all three axes equal 0, 0, 0 respectively. This position is known as the UCS — the user coordinate system — and is the default position from which the CNC cutter will start, and where it will return to when it has finished. It is up to the user — as the name suggests — to establish it in terms of each particular project.

Driving down the z axis

For the z axis, Des uses a small conductive plate of a known thickness with a sensor fixed at one end that attaches via a magnetic tip to the router spindle at the other end. He places the plate on top of the work and, from the control panel, starts a routine that begins with the router driving down the Z axis before touching the top of the conductive plate. It then backs up before coming down again, this time more slowly until it just retouches it. It then stops, at which

“This is one example of the CNC router ‘making’ its own parts”

time Des removes the sensor and the z ‘0’ has now been established.

Since the depth of this particular conductive plate is known as 6.8mm, any setting can now be calculated in relation to this point with regard to the thickness of the material being used. From here on in, anything above this point is calculated as ‘+’ and anything below is calculated as ‘-’. If ‘grabbing’ occurs between the tip of the cutter and the material to be worked, minor corrections can be made at the control panel.

Any depth can now be established — either up or down, + or -. Now, it’s just a matter of determining the thickness of the material to be worked

on and the depth of the cut into the spoil board. From here, the x and y coordinates can be established as the beginning and finishing points prior to beginning the work.

Further considerations

Just when you felt it was safe to get back into the water — or turn on the power — there are four more considerations. They are:

First: the depth of the cut each time it goes around the path, and by extension, the number of circuits it makes in order to achieve the desired depth. This is all set in EstlCam as part of the initial generation of the G-Code.

Second: the speed at which the cutter moves around the material — known as the feed rate. As a general rule, the slower the feed rate the better the surface finish. This is not the same as the speed of the cutter blade — in this case, 22,000rpm. Rather, it is the time it takes to complete each path circuit. ►

The complete CNC cutting platform at home in Des' garage. Self contained and mobile, is this a future 'loom in the lounge' of pre-industrial revolution times?



“If ‘grabbing’ occurs between the tip of the cutter and the material to be worked, minor corrections can be made at the control panel”

three: MDF, rimu, and ply. Let's look at the results.

Routing is usually done against the direction of the grain. If it was a manual operation and you were trying to cut in the same direction as the blade spins, the material would just fly off and either be damaged or potentially hurt someone. In the case of our CNC router, the material is well held through the cam levers described above; however, the principle is the same.

Third: the way in which the cutter transitions the depth change. It can either plunge down as you might do with a manual router, or it can ramp down so that the actual starting position for cutting the next circuit is slightly further ahead each time, with the 'ramp' being cleaned up as the router comes around to finish up. ► Plunging down is not a good option here as the centre of the blade has no cutting ability — this primarily occurs at the outside edges. So, trying to plunge without any ability to cut simply forces things that could ultimately result in damage to either the material or the cutter/router itself.

Fourth, and finally: how does all this stay in place? If you're going to just cut out a shape, it won't be long before it starts to shift and move — it has both a fast-spinning cutter and a moving router acting on it, and these forces aren't trivial. The answer is to set holding tabs, which was one of the variables in the initial toolbox right back at the beginning when the cut was being set up in EstlCam before the file was exported out to the G-Code the CNC router reads. You may require only two tabs, or you may need three or four; it depends on the size of the item you're making and your experience. If

in doubt, put in too many; it's a simple clean-up job afterwards with a chisel and some sandpaper — and next time don't use so many.

The materials

The choice of material is important. We couldn't use MDF for the cheese slicer as it wouldn't last, yet, for something as small and fiddly as that, the raw item straight off the CNC machine was good. Why? Because three more variables come into play at this point: the direction of the path in relation to the direction of the spinning cutter, the nature of the grain if it is wood, and the tightness of the curves.

Let's take a look at the implications of these. For this article we cut out

Grain dictates cut path

If the wood is soft, such as pine, then the grain is broad and won't help hold the cut path, particularly on the tight curves. A curve cut from the cutter against the grain will be fine; however, one made in the direction of the grain will distort due to the soft nature and lack of resistance inherent in the wood. This is evident in the tight curves, for example, where one side will be fine while the other side will distort. The consistent nature of the MDF means that this problem does not occur, making it round one to the MDF. The use of ply, however, with its cross-lamination layers within, made a much better choice. For the final result we used the Rimu.' ►



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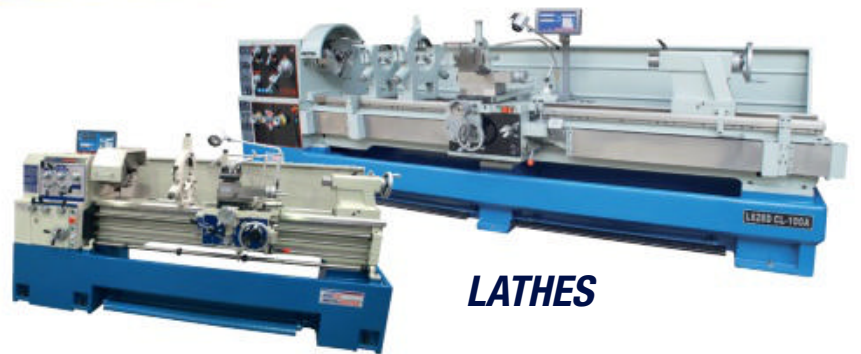
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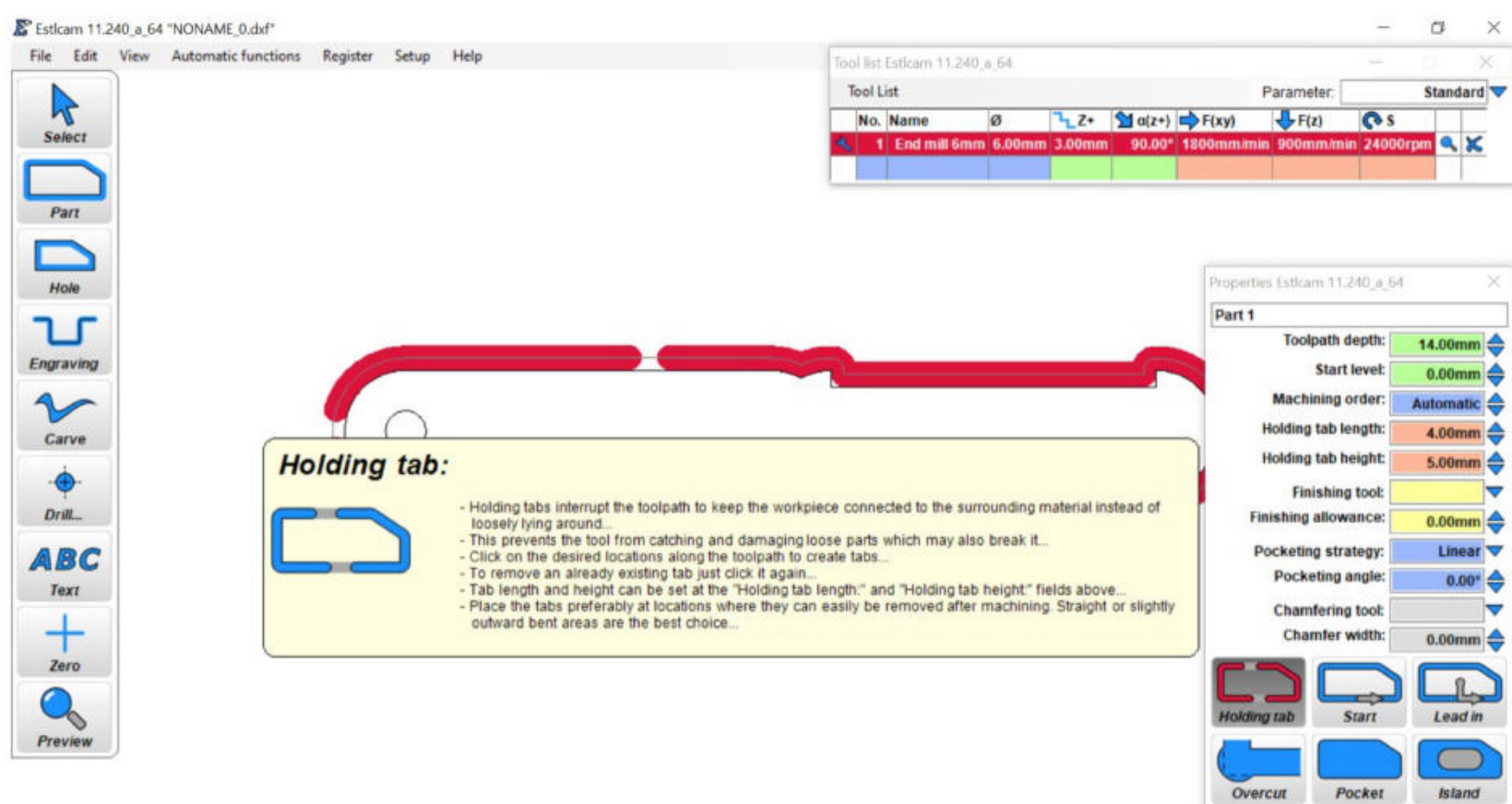
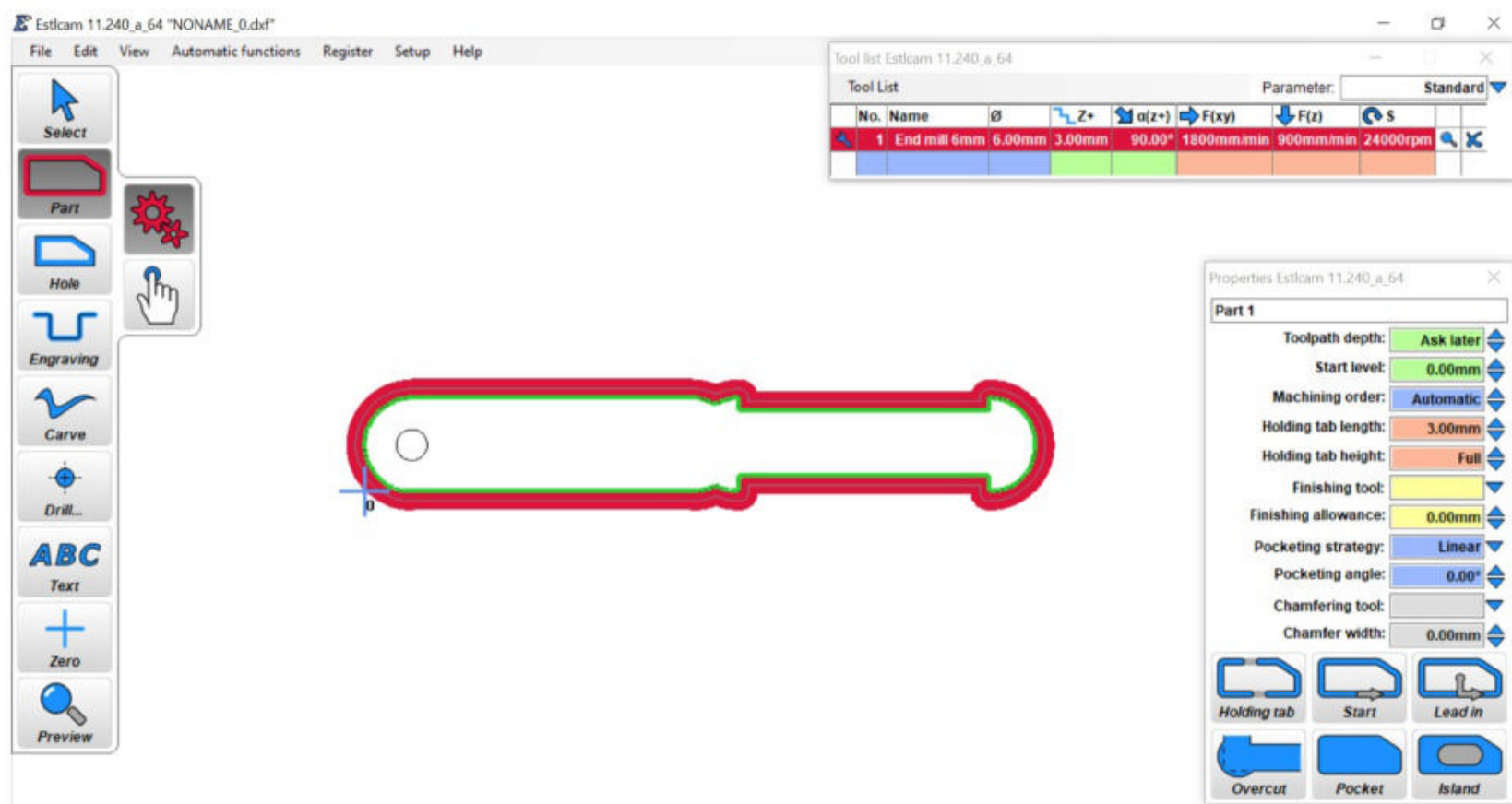
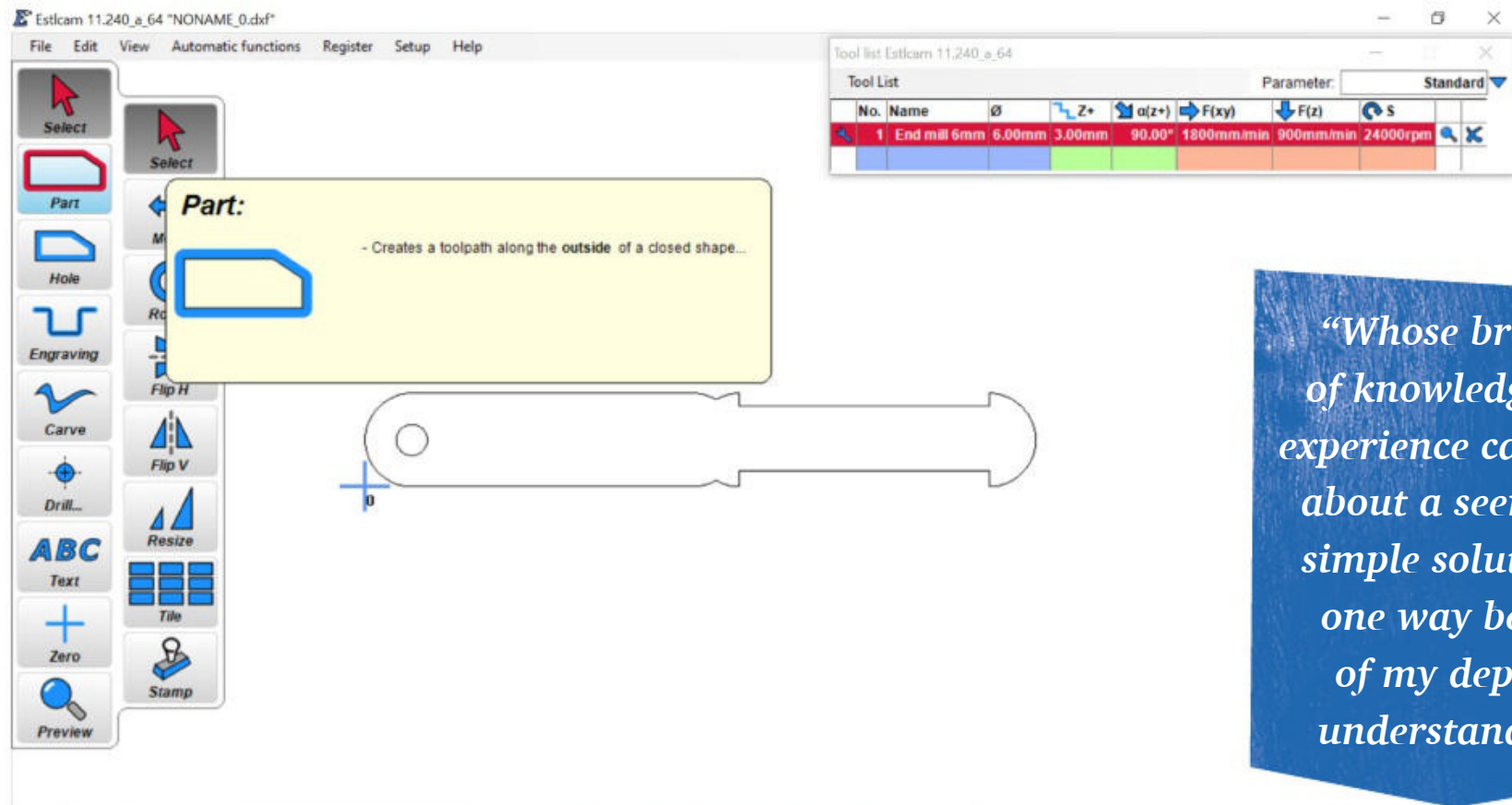
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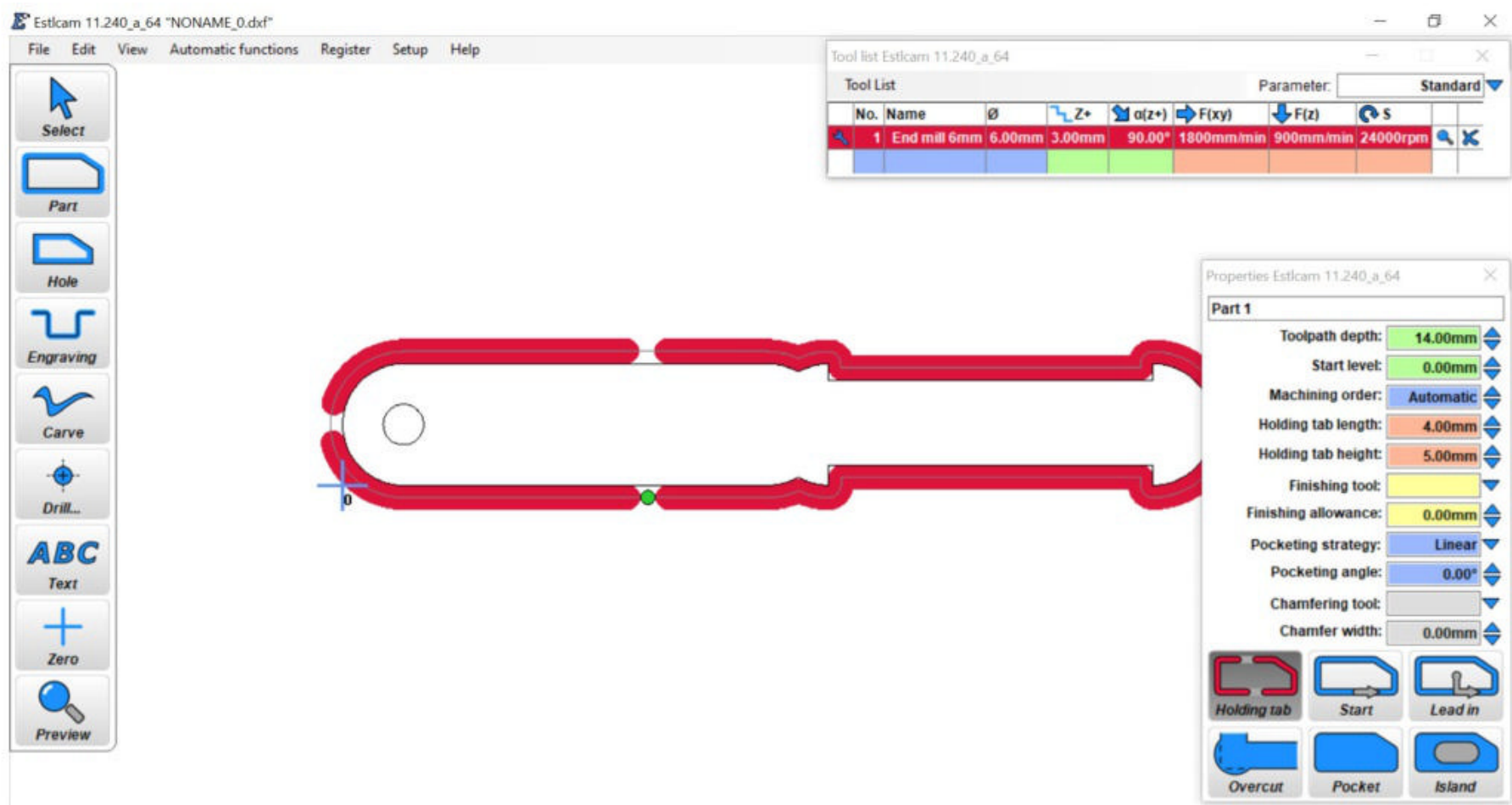
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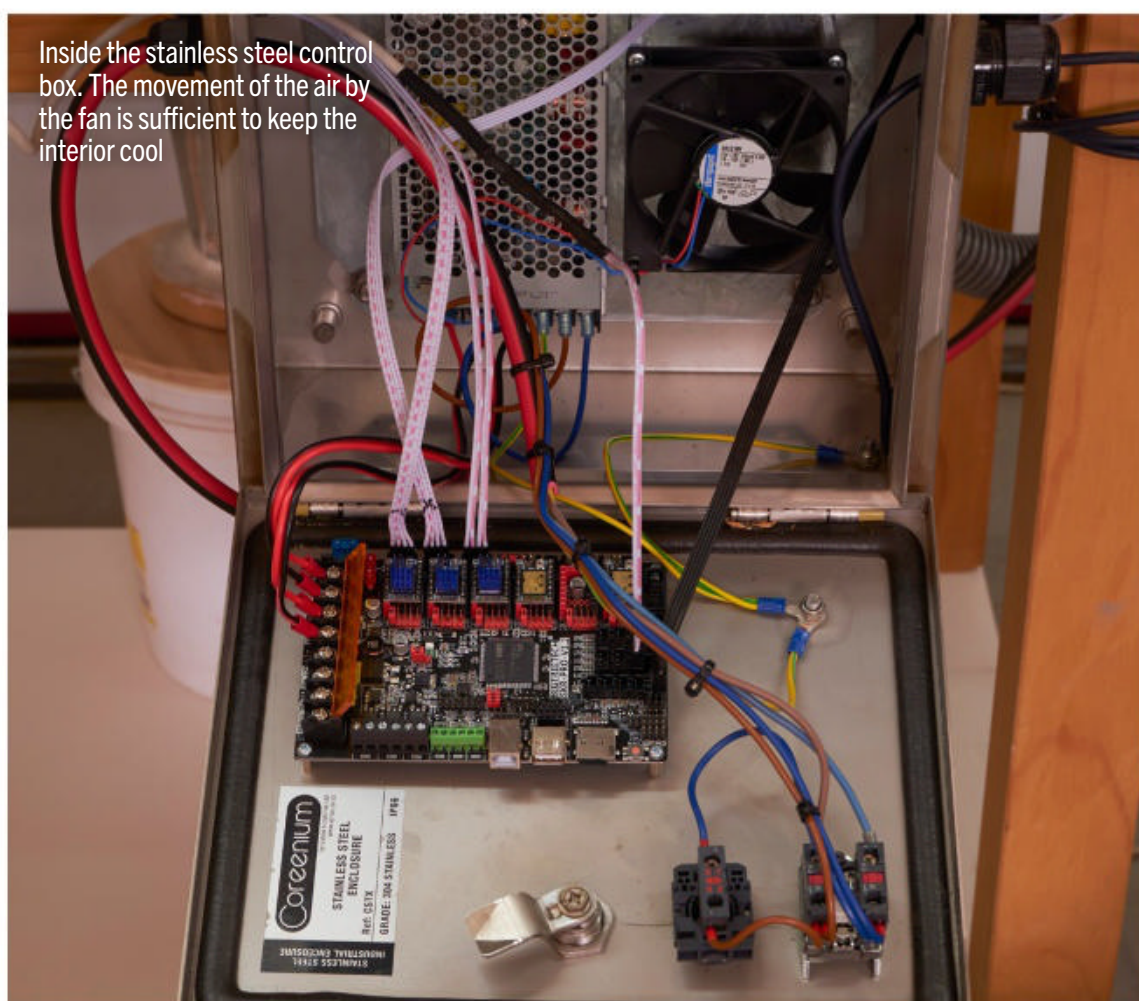
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The dust extraction shelf under the table keeps the whole system self-contained and mobile



Inside the stainless steel control box. The movement of the air by the fan is sufficient to keep the interior cool

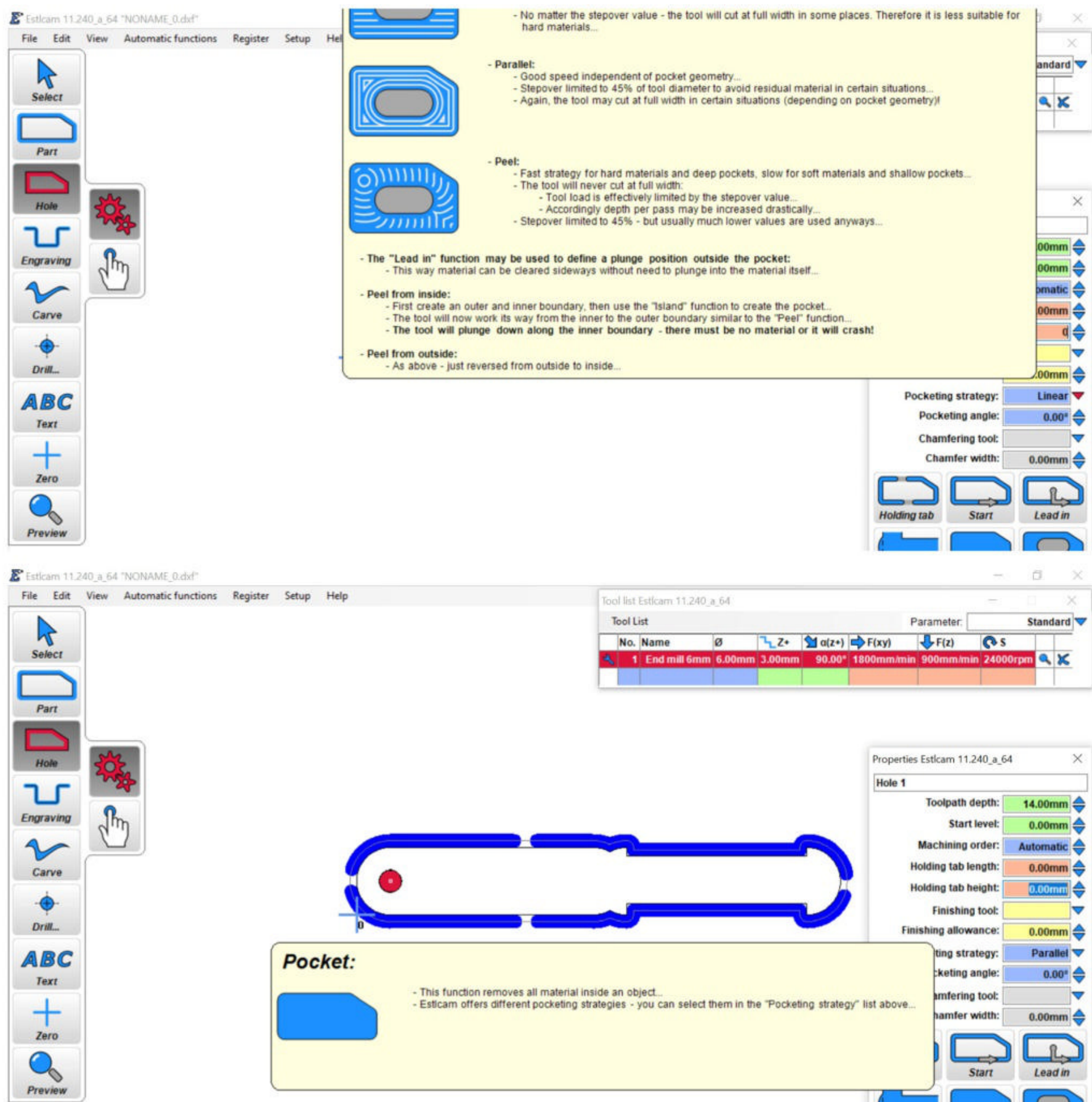
Dust extraction

Dust is always the enemy, and this process is no exception. What is exceptional, however, is the way the problem has been resolved here. Enter Gavin Melville, who has previously contributed to my articles. Gavin is one of those rare people who is just damn good at what he does, and whose breadth of knowledge and experience can bring about a seemingly simple solution — one that would never have occurred to me, for example.

“As a general rule, the slower the feed rate the better the surface finish”

Gavin designed a small hood and then printed it on his 3D printer. It was designed to be set a couple of millimetres above the work and to operate in the manner of a cyclone extract system, with air drawn in from

just above the cutter blade and exiting out a side port, having ‘cycloned’ its way around the cutting blade, before being drawn by a mounted hose via a vacuum cleaner to a bucket. This is the system, set up on the shelf below, that was referred to earlier. The hose is supported by an aluminium cradle arrangement that Des made; it allows the hose to move freely throughout the operation. This operation only works if the material being used is flat — as is likely to be the case most times. ►



These screen shots show the different stages of data entry into EstlCam in order to generate the final G-Code for the CNC router. The original cheese slicer was drawn up in iCADMac, and AutoCAD derivative. Note the establishment of the cutting path in red, and the addition of the holding tabs as gaps between. The hole in the handle was also cut here rather than having to be drilled in later

Should a contoured piece of material be worked, a brush type of hood would need to be used. This would allow the material to pass beneath while assisting the vacuum process to remove the dust. A timber lid replaces the 10-litre bucket's plastic one, holding a cyclone catcher that assists with the efficient transfer of the dust to the bucket. This device was featured in Issue 80 Sept-Oct 2018 of *The Shed*. The result is a virtually dust-free work environment.

Other parts

The white 'tank' track — known as the drag chain that holds all the cables and enables them to move without fouling — was found online and 3D printed by

Gavin, as was the box that holds the controller and the links that fix it to the rails.

The aluminium structure that supports the vacuum hose for the dust extraction and the channel that the drag chain travels along were sorted by Des. The stainless steel power box with the large red 'stop' button is also the work of Des, with Gavin wiring it all. There's a cooling fan inside, with no vents around it — it seems they are unnecessary as the movement of the air by the fan is considered sufficient to dissipate the heat. The 25mm aluminium rails with the ball-bearing mounted cradle and stepper motors that hold it all together and upon

which the kit runs — along with the supporting brackets that mount both this to the table and the router to it — were all part of the initial outlay.

The 3D-printed parts and aluminium components described above all came from either Des or Gavin. There is need for a computer to prepare the initial files — in this case Des used an older laptop to prepare the SD card for the controller. Much of this is based around existing or older components — for example, the vacuum cleaner was \$25 from the local Ecostore and the laptop was an older one that has since been replaced. In a sense, this has all been cobbled together — but isn't that the strength of sheddies? ►

What did it cost?

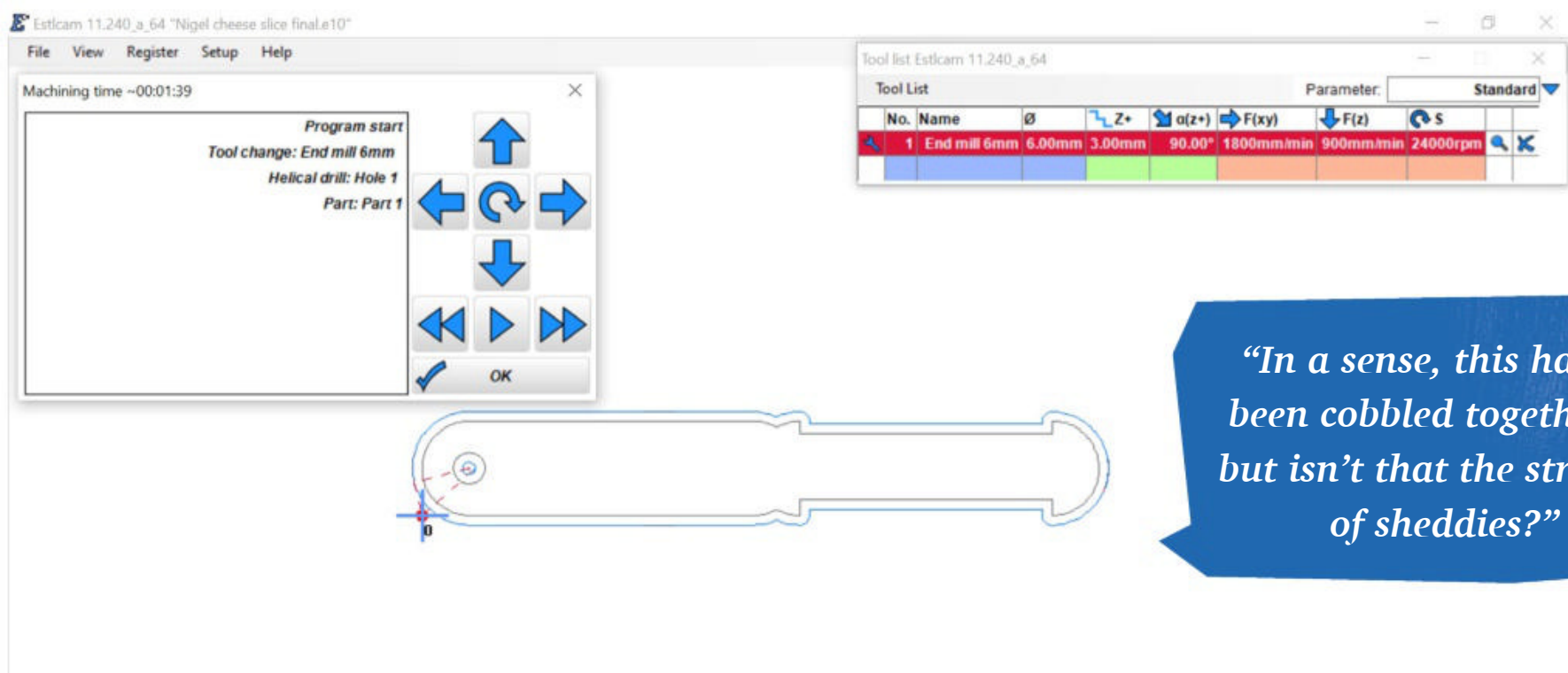
The kit was imported from V1 Engineering in the USA, and the router is a 6mm trimmer from Makita. While there are cheaper options, this kit was designed around the Makita, so anything else would have required a modification of the cradle that supported it. The 25mm tubing was purchased locally. The final cost of the whole kit and kaboodle was around \$1400.

Primary hardware requirements are:

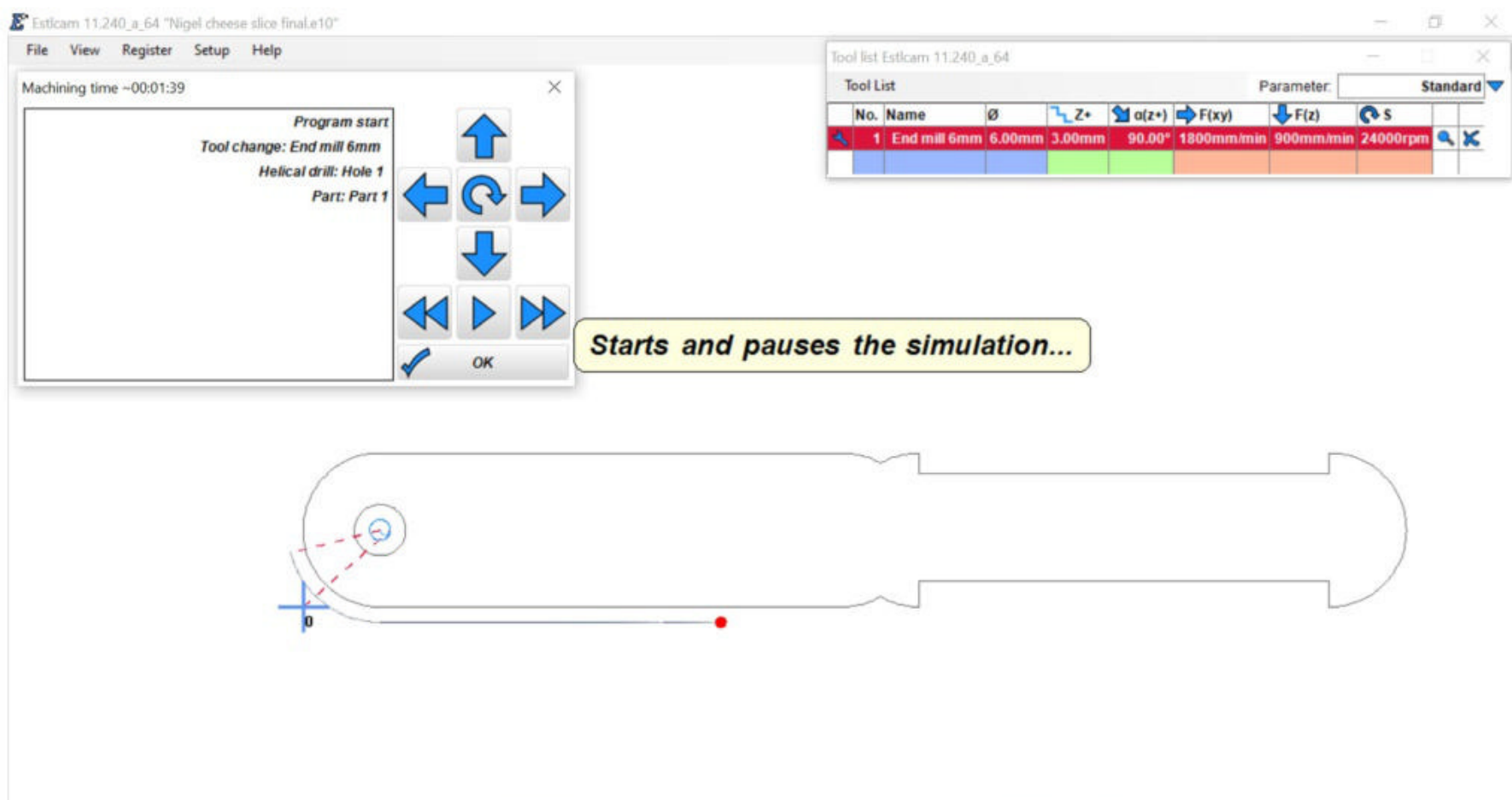
- Makita Trimmer 6mm — https://www.bunnings.co.nz/makita-trimmer-6mm_p0255646
- V1 Engineering kit — <https://www.v1engineering.com/mpcnc-primo-is-live/>
- 25mm tube for the x, y, and z tracks

The rest was either on hand, second hand, or could be 3D printed:

- Second-hand vacuum cleaner
- Old laptop
- Previously built dust extraction cyclone and old paint bucket
- Suitable table with castors and shelf for the dust extraction
- Aluminium dust extraction structure
- 3D-printed 'tank track' drag chains and the aluminium channels they run in
- 3D-printed cradle for the controller
- Stainless steel box for the electronics, the wiring, and preparation — including a USB cable
- Height sensor — the 6.8mm conductive plate steel
- Templates for the locking cams — 12mm ply
- 4mm-thick PDF spoil board with 80mm grid
- Inside the stainless steel control box, with wiring by Gavin. The movement of air by the fan is sufficient to keep the interior cool.



“In a sense, this has all been cobbled together — but isn’t that the strength of sheddies?”





The CNC router cutting out the ply cheese slicer

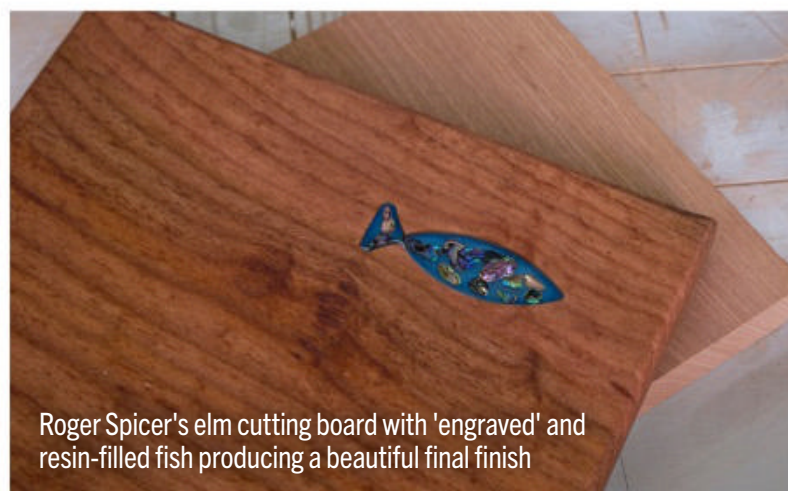


The three materials used for the cheese slicer — ply, rimu and MDF. Note the furriness of the second MDF attempt — this was the result of using a blunt blade



The cheese slicer cut from ply — note the movement at the top of the second one caused by the router being bumped due to the cam and box tensioners being too high

The rimu cutter which I eventually decided on - all I now need to do is fit and tension the cutting wire



Roger Spicer's elm cutting board with 'engraved' and resin-filled fish producing a beautiful final finish

Conclusion

Both the set-up and the process sound daunting given the range of steps and variables involved, particularly if there is the need to manufacture interface parts such as the drag chain, and the dust-collecting hood and corresponding aluminium structure, not to mention the table it sits on in order to ensure a safe and reliable operation. However, much of that is very 'sheddie' and there will always be someone around to assist and ensure that it is well constructed and safe to use.

Keep in mind that any electrical work will need to be signed off by an appropriately certified electrician. As to the process for the actual operation each time, in the end it comes down to experience and determination. Take

the breadboard featured in this article, for example. Halswell MenzShed coordinator, Roger Spicer, produced it from some elm he had, using Des's CNC router to essentially engrave the shape of a fish 5mm into its surface, before filling it with fine stones and resin.

It's worth it

The result is beautiful, and well worth the learning curve. As for the cheese slicer, it turns out that either piano wire or a guitar string is fine enough and strong enough to do the job. It also needs to be able to be tensioned, and I have yet to complete that. The exercise certainly proved to my satisfaction that competency here, alongside a modest investment even in just the 3D printer and CNC router kit, offers an excellent beginning to what could

"Keep in mind that any electrical work will need to be signed off by an appropriately certified electrician"

be an enterprising venture.* It's an entrepreneurial extension of the loom in the lounge — preferably without the loom in the lounge.

** Please note that this is my opinion only, based on my observations and business experience, and cannot be considered as sound business advice. That is the realm of others who have the background to be able to help determine the viability and sustainability of such an operation. 📄*

FOLDAWAY



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You're Wanted!

Perfect opportunity to join dynamic businesses

By Sarah Beresford

Covid-19 and the lockdowns of the past few years have had something of a halo effect for some industries.

“When we went into the first lockdown, I was prepared for the toughest year in the 10 years I’ve been with the business,” explains Miles Donald, NZ branch manager of Machineryhouse, “but despite everything we were flat out in 2020 and recorded significant growth in sales — and it hasn’t stopped. It’s been record breaking.”

The only downside has been the increasing struggle to recruit staff to join

the burgeoning business.

“We carry a huge range of product and focus on the engineering side, from sheet metal, woodworking, and automotive

“We have managed to hire a couple of storemen, but we’ve had no response to our sales staff vacancies”

right through to storage, and cater to both big business and DIY. We placed ads in November last year for staff and we’ve never struck it so hard,” says Miles. “We have managed to hire a couple of storemen, but we’ve had no response to our sales staff vacancies.”

All sales info is close at hand

Miles says that, although Machineryhouse stocks such a wide range of equipment, they provide sales staff with a lot of comprehensive information on product.

SOME SMALL PROJECTS PLEASE

LETTER OF THE MONTH

Dear Sir,

As a regular reader of *The Shed* I am a great follower of the home workshops output as shown. There is one problem: they are all major jobs, and my efforts are quite small!

At 92 I have had to curtail my activities to what can be achieved from a small shed.

My treasured vintage Workmate has now been fitted with wheels; these are discarded outriders from a child's bicycle and were obtained from a local op shop. This enables me to roll it in and out of the shed without too much lifting. The step has a box added; this carries essential tools such as a set square, pencils, and



drill. Its main purpose is to give me a five-minute sit-down at regular intervals.

Plans to add another collapsible wheel

to avoid lifting totally, a moveable ramp system to bridge the step, and a cup holder for my coffee are all on hold till Covid restrictions allow me to shop.

A stroke six years ago lost me a lot of strength so now all my main tools are battery powered. They are a lot lighter to handle with nearly the same power as my old 240V ones were, and there is no messing with extension cords.

Deigh Davies

Thank you for your letter, Deigh, and good onya for keeping on shedding and adapting your tools, etc. to work for you. You are an inspiration to us all.

One of the things that came out of our recent reader survey is readers' desire for smaller projects to undertake and more woodwork projects to boot. Over the coming issues we will be addressing those requests, so keep a lookout for more projects like these that may suit you and other readers.

Ed.

SOME IT TIPS

Dear Greg,

In *The Shed* 99 there are a couple of articles that relate to items I have had dealings with.

For stories of women building their own boats, my partner built her own sea kayak over 20 years ago. It was the first of that design, the Mac50, and the designer was available for technical assistance if needed. She has paddled the kayak in many places in New Zealand ranging from Port Pegasus at the bottom of Stewart Island to the Bay of Islands. The Marlborough Sounds and Tasman Bay have been well explored.

There have been more than 50 Mac50s built in New Zealand and a few overseas. Being the designer, I finally built one of that design for myself, the narrow version designed for light, short women. I fail on two of the three parameters as I'm only light.

In the article "To Serve or not to Serve" by Nigel Young, he mentions using Linux Mint on older computers. The Rolleston Men's Shed, mentioned

in the article, only runs Linux Mint and also upgrades members' and others' computers by fitting an SSD (solid state drive) and Linux Mint. The result is a complete system that is reliable and powerful and, importantly, free. It comes with a web browser and an office suite by default plus a lot of useful apps.

The laptops usually get a 250GB SSD fitted and the removed disk has its files and folders copied on to the new system via an SATA to USB cable. A 250GB SSD costs under \$60. Fitting one can range from "one screw and plug it in" to the worst laptop with 20 screws and another five under the keyboard and then a crowbar to prise the case apart enough to get at the disk.

A complete Linux Mint system installs in under 10 minutes and then gives it a few more minutes to install updates. Setting up with extra, useful apps and the desktop layout and the entire set-up takes about 30 minutes. So far about 40 have been done.

Installing from a USB stick is easy, providing it is done the right way. An

.iso file is downloaded from the web and saved to a computer. It is then "burnt" to a USB stick.

If running Windows, Rufus can be used. If running Linux, simply right click on the file and in the menu that appears choose the option "Make bootable USB stick". Providing the computer that is to have an installation has been told to look at the USB stick first, not the HD, it should boot up from the stick. The computer can be run from the stick to see how things work, and without committing the user to Linux. Of the three icons that show, the third one is Install Linux.

Nigel also mentions cloud storage at \$5 a month for 200GB. Mega offers 20GB for free and 400GB for \$8.46 a month.

As an aside, the mass spectrometer instrument I maintained when I started at Canterbury University was run by Ron Pankhurst nearly 50 years ago. Good to see ("If I Had a Hammer") that Ron is still hammering away.

Sandy Ferguson

Rolleston Men's Shed IT

CALENDAR DISAPPOINTMENT

Hi Greg,

I was hacked off to find your calendar (*The Shed* 2022) had the week starting on Monday. Whoever started that craze had a cushy well/overpaid job and not enough to do. They also probably worked 9am to 5pm Monday to Friday. My Farmlands Calendar has Sunday at the beginning of the week.

Ken Keen

Sorry to hear your disappointment, Ken, we are city boys here in the magazine world so our week always starts on a Monday with two days off — Saturday and Sunday. We are happy to look at changing that day flow if the majority of our readers think it's a good idea. When we are prepping the 2023

calendar, we'll run a poll and let readers have their say. Keep an eye out for it on our Facebook page.

Ed.

TELECOM MEMORIES

Dear Jude,

Very much liked your [Back o' *The Shed*] article in issue 95.

My golden age was in advance of yours by a few years and differed in that I went to uni in the UK.

I am very interested in your Telecom experience as my time there was during the installation and roll-out of the CDMA mobile network. I am keen to know who the leaving shareholder was, as there were certainly several strange characters there during my time.

Keep up the good work.

Wally Maher

LETTER OF THE MONTH PRIZE

Every issue, our Letter of the Month winner will receive a copy of *Best of The Shed 2*. More top projects from 15 great years of *The Shed* magazine

Letters should be emailed to editor@theshedmag.co.nz, or posted to Editor, *The Shed*, PO Box 46,020, Herne Bay, Auckland 1147.



Sheddies



PAINTING TIPS FROM THE RESENE EXPERTS

So you're back into the swing of the year but perhaps didn't quite get all those projects finished that you had planned to do over the holidays. To help you get your decorating projects done, we've asked the Resene experts to share some of their top tips:

Break it up

The thought of painting a whole house can be a little daunting. Rather than try and tackle everything at once and end up with a muddle everywhere, break your project down into smaller parts, ideally to take a weekend or so. Then you can focus on finishing one part at a time before starting the next. Not only is it more motivating when you can get stuck in and finish in a couple of days, it also means that your home will be easier to live in while you work through the various stages.

A good place to start is an exterior housewash with Resene Paint Prep and Housewash and to treat mould with Resene Moss & Mould Killer. These will clean the surface and kill mould. You'll have an instantly cleaner surface so it will be easier to see any repairs needed before you start painting.

Plan your painting times

If you're painting in the warmer months it pays to start early, take a break in the hottest part of the day and then restart in the afternoon. This makes it easier to keep a wet edge on your paint and to avoid the harshest effects of the sun on your skin. If you're keen to decorate all day, have an interior project ready to do in the middle of the day – this might be cleaning or prepping a wall. In the cooler months the opposite applies. In winter you need to give the surface time to warm up before you start painting. And you need to stop early enough so the paint can dry before there is dew overnight.

Ace the additives

Our climate fluctuates from hot to cold and something in between.

To get the best out of your paint, make sure you are using the right additive for the season.

In winter, use Resene Wintergrade Additive to help your waterborne paint dry down to a super cool 3 degrees.

If there are light showers about, use Resene Umbrella Additive to give your paint early protection against the weather.

In summer, use Resene Hot Weather Additive to give you a longer wet edge in the hotter months so you have more time to paint before the paint dries.

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Bob's looking forward to some tasty veges



MOVING UP

THERE ARE FEW THINGS AS SATISFYING AS PICKING VEGGIES FROM YOUR OWN GARDEN

By Bob Hulme

Photographs: Bob Hulme

A vegetable garden had been on my wish list for some time since downsizing to a smaller home. Life and other interests filled my time for a couple of years, but the second hard Covid lockdown made sure I had some downtime. It also meant that nothing had to be rushed, so there was time to plan the project. It's in my nature to put time into researching and planning before the 'doing' part of any project. Some people just launch into a job and it works out OK, but it's not how my brain works. The internet makes digging for info so much easier. Looking for kitsets on the market was straightforward, but I found they were costly and not always the size I wanted. Of course availability and freight issues were problematic at the time, too.

Shape and size

The design I settled on covers a footprint of 3 metres x 2 metres with

a walk-in 1m x 1m pocket in the middle. This meant I wouldn't have to reach any more than 1/2 metre.

"Some people just launch into a job and it works out OK, but it's not how my brain works"

The other dimension, of course, is the height. Most kitsets were around 400mm high and, while that would have been OK, I did not want to settle for just OK. I felt that 600mm was a good height for me, being a tall person, and that as time inevitably marched on, my ability to bend down comfortably would lessen. That's a

polite way of saying I'm not getting any younger!

Materials

What material to use was the next question. Concrete blocks would have been a good option from the point of view of longevity. No problem with rot. The issue though is that a good foundation strip would be needed, probably concrete, and that was extra cost as well as effort. Also, locking them together would mean concrete poured down some of the holes or maybe rammed earth. Speaking of rammed earth, old tyres might work and they could have plants growing in the gaps where the tyres overlap. That works well as a retaining wall or fence, but for a raised garden it makes reaching into the garden centre more difficult. Anything made of steel would easily corrode, as we live in a coastal location. ►

Treatment

Finally, I settled on timber. The look is natural and timber is easy to work with. Now, the great debate lifts its head about whether to use treated or untreated timber. This time the internet did not help much at all. They say that there is so much information on the interweb that you can find info to back up whatever side of an argument you already decided to support. That was the case.

While I like timber for landscape projects, experience has taught me that when it is in contact with the ground it rots and is not fit for purpose after three or four years. For one project I decided to use macrocarpa timber, believing it would last longer than pine. Had I used it above ground, it probably would have lasted longer. Not the case when it's in the ground, unfortunately!

The local sawmill sold both treated

“Concrete blocks would have been a good option from the point of view of longevity”

and untreated pine, so I paid a visit to talk about my project. The answer was a lecture on the merits of treated timber and how the method of the treating process means it is unlikely any significant amount of the treatment chemical can leach into the surrounding soil. I was advised to look for proper scientific studies into this rather than just opinion pieces. Well, it appeared that they were right. The scientific data showed that no significant increase in those chemicals was found in soil where treated timber was used.

A decision is made

The disconcerting thing is that some countries have banned the timber-treating chemicals we use in New Zealand. So, still not totally clear one way or another. I made the decision to build with treated pine and coat the inside faces with a sealer.



Choosing a sealer was not a long-winded decision as I had used a product before and had enough left over for this job. It's called BitPost and is used as an alternative to creosote or carbolineum.

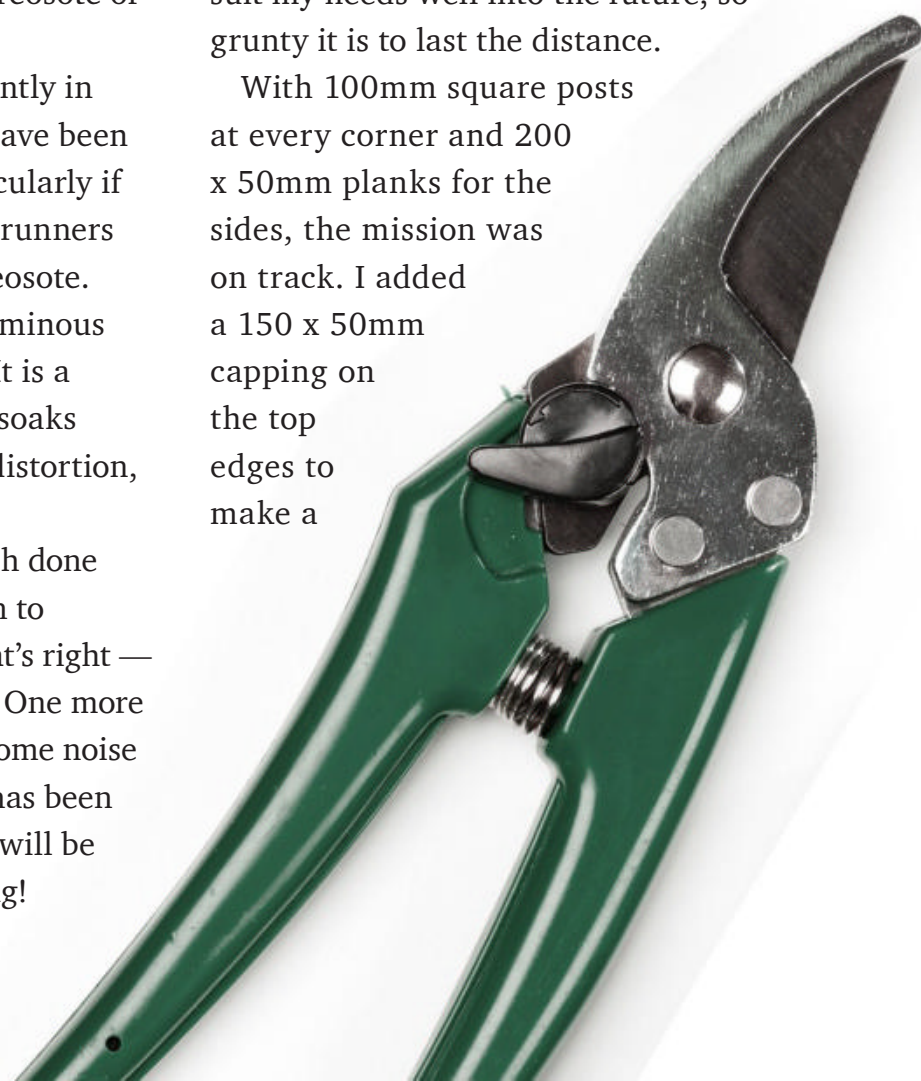
These products are apparently in the naughty corner as they have been found to be unhealthy, particularly if your horse nibbles the fence runners you have smothered with creosote. BitPost is described as a bituminous emulsion/polymer product. It is a water-repellent coating that soaks into the timber and retards distortion, movement, and splitting.

With the important research done and decisions made, it was on to sketching out the details. That's right — still not launching into it yet. One more step to go and there will be some noise being made. If the planning has been up to scratch then the noises will be construction and not swearing!

Lasting the distance

Grunty is the word that describes my approach to how this structure should be. The whole premise is that it should suit my needs well into the future, so grunty it is to last the distance.

With 100mm square posts at every corner and 200 x 50mm planks for the sides, the mission was on track. I added a 150 x 50mm capping on the top edges to make a





Assembly begins



Screwing the boards on

“The disconcerting thing is that some countries have banned the timber-treating chemicals we use in New Zealand”

surface on which to rest garden tools or a bucket. This set it off nicely and gave the whole thing a finished look. A significant feature was that I did not extend the corner posts down into the ground. Even though the ground that I put it on was sloping slightly, I did not consider that the structure would need anchoring in place. Once full of soil it would be near impossible to move. Sure, in the event of a major earthquake making the underlying ground behave like a liquid it could easily move around, but in such a scenario that would be the least of my worries. ►

Construction

Builders will shudder when I tell you I have not placed the corner posts vertically. They are at right angles to the ground and, as that slopes, the posts are on a lean. The theory here is that the whole raised garden is sloping in the same way as the ground it sits on so that it is angled towards the sun.

Of course, if the ground actually sloped away from the afternoon sun it would have been a different story. Placing this garden was dictated by where I had room on the section, and the spot available is not exactly ideal for catching the most sunshine. Not too bad in summer, but I think in winter it will be starved of UV. Hopefully, the natural slope will help. ▶

“Grunty is the word that describes my approach to how this structure should be”



Side boards all on



Inside faces coated with the sealer.

Compost



Plastic netting compost bins

My efforts at composting in the past few years were limited to throwing unwanted vegetation in a pile near the back boundary. Now I have this raised veggie garden, I thought it was about time I got more organised. Many years ago, I built a series of three compost bins with timber sides like picture frames with wire netting on them. These worked really well as the composting material could 'breathe'. Plenty of aeration is

important; otherwise the compost goes slimy and smells awful.

This time, I tried a new idea that my wife spotted on the interweb. This simply involves using a roll of heavy-duty plastic netting (it won't rust). Coiling it out to a diameter roughly the same as its height seemed about right and then tying the overlapped ends with cable ties did the trick. Could not have been easier.

A series of three compost cages is the aim. As one is filled, the next one is started on, and by the time the third is full the first one is likely to have its load of compost ready to use. My understanding is that a great way to use compost is to simply put it on top of the soil. No need to dig it in — the theory being that earthworms take the compost down into the soil for you. They do the work.



Stainless bugle head screws

"Actually, if you're doing something, you might as well do it the best way you can"



Inner faces coated with bitpost and capping on

“Experimenting to find out what grows best in your location is always a good idea”

The corners were made so that the posts are on the outside. This avoids the posts touching soil apart from at their bottom end. It also means that the inside of the garden has a clean corner. When I am digging the soil I do not have to work around a post at each corner with the spade and can plant right up to the sides and end.

Job made easy

After sketching it out, I was able to come up with a cutting list. My friendly local sawmill was happy to cut the timber to length, so the only cutting I had left to do was mitering



Mitred join at the ends of the capping boards

Healthy



Plentiful earthworms indicate good soil condition

To grow good plants, it is important to have good soil. Healthy soil has good physical, chemical, and biological fertility.

Too often in the home garden, people concentrate on the chemical aspect by trying to control the acidity and also hoping some liberal handfuls of a general fertiliser will do the job. I know I have done that in the past. It is now evident that the biological health of soil is vital and that by over-applying fertilisers we damage all those

important microbes.

These bacteria, actinomycetes, fungi, algae, and protozoa form a community within the soil that essentially processes organic matter. By doing so they turn nutrients into a more available form for plants to absorb.

We usually see indicators of good soil condition such as earthworms, but microbes are not so obvious to the naked eye. Adding compost is a way of keeping these tiny little guys well fed and your soil healthy.

the ends of the top capping pieces. This was a great advantage because I do not have a radial arm saw. Screws are my preference rather than nails so I used stainless screws to hold it all together — 14-10 x 100 bugle head screws with an internal hex drive were the ideal ones to use. While I could do nearly all the work on my own it was super helpful to have my wife lift the other end of the long planks so I could clamp them into place before screwing them onto

the posts. By staggering the screw positions I was able to avoid any clashes with screws coming in from the other side of the post.

It was a no-brainer to build it in place because of the weight of the finished structure. The last pieces of wood to be screwed on were the top cap pieces. I marked a 45-degree line on each end of one of the pieces, cut to the line with my skill saw, then screwed it on. To cut the mating pieces, I laid them in place and marked a line

to cut that matched the piece already screwed in place. This made sure that the join was perfect — not that it matters; it is just a garden surround, right? Actually, if you're doing something, you might as well do it the best way you can.

Irrigation

Gardening should not be a chore. Both watering by putting out the sprinkler and remembering to do it regularly fall into the chore category for me. The answer was to install a watering system that would run off a timer. I ran the tubing underground to the raised bed then brought it up the inside so I could run the loop of tubing for the nozzles around the edge of the capping timber. This would make it easy to change nozzles and their positions if needed. By having tall vertical stalks off the tubing I could be sure that plants close to the edge would not stop the spray reaching further in.

The soil

The volume of soil needed was easy to calculate:

3m long x 2m wide x 0.6m high = 3.6 cubic metres less the walk-in cut-out: 1m x 1m x 0.6m = 0.6 cubic metre
So, a total of 3 cubic metres.

I had a pile of compost so I forked that in first. It filled to about halfway up the sides. That meant three trips with my trailer to the landscape supply place to get 1/2 cubic metre of topsoil each time. Next spring I will probably have to get some more topsoil as the compost below it decomposes further and reduces in volume.

Planting

With the heavy stuff done, it was time to get some plants in. After deciding what to grow, the next decision was whether to grow from seed or to buy seedlings. A good plan was to go for some of both. I went for seedlings of lettuce, capsicum, celery, tomatoes, and sugar snap peas. For carrots, beetroot, dwarf beans, and radish I used seeds. ►



Hybrid tomatoes are great and you have to plant those as seedlings. A good yield from them means that you do not have to have many plants, and so save space. I planted capsicum seeds as well as the seedlings so I could have some sooner as well as later on. Carrots, beetroot, and radish all grow well from seed and I left room to plant more seeds of them every three weeks or so to give a constant supply over the season. Not sure about the peas. They are a bit of an experiment. Experimenting to find out what grows best in your location is always a good idea. Sprawly plants like pumpkin, cucumber, and melon can take up a lot of space, but perhaps could be trained to grow over the side walls of the raised garden. They could be something for me to experiment with.

Cost

All up, the cost was below \$1000. The timber was between \$500 and \$600, but with building material prices being volatile at the moment it would pay to check with your local supplier. Sure, you can buy a lot of vegetables from the supermarket for that but you cannot get any fresher than veggies picked from your own garden, minutes before cooking a meal. There are few things as satisfying. 🥬



Irrigation tubing around the edge of the capping timber

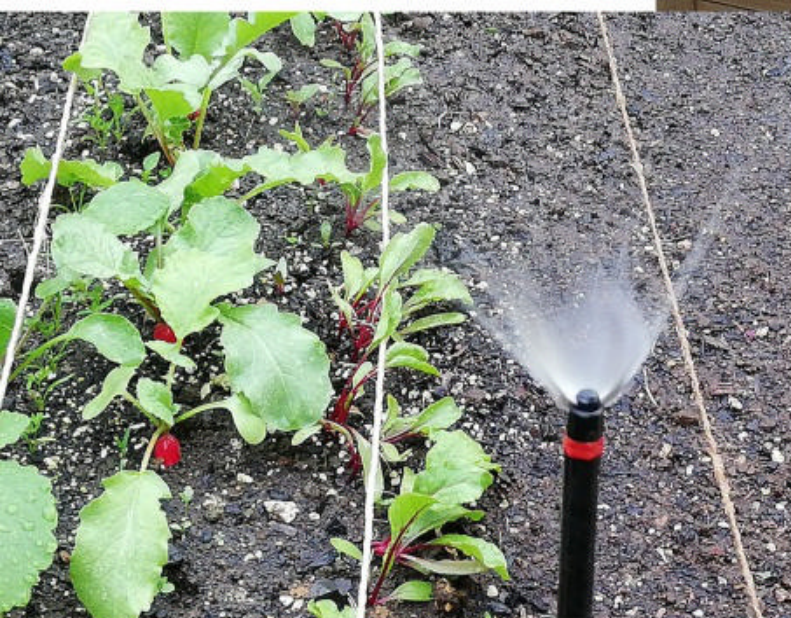


Burying the irrigation tubing



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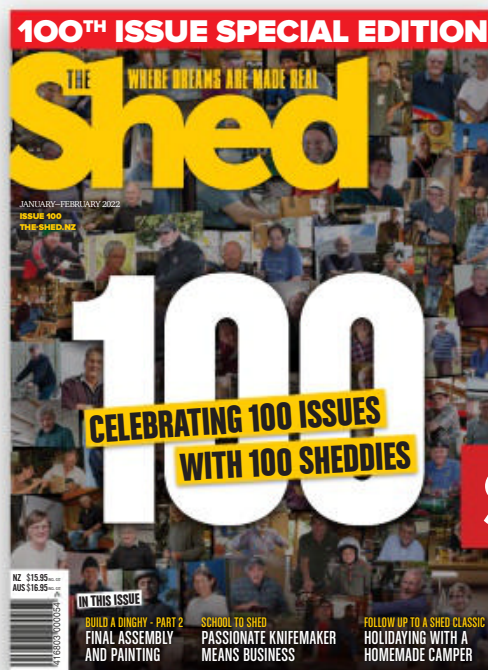
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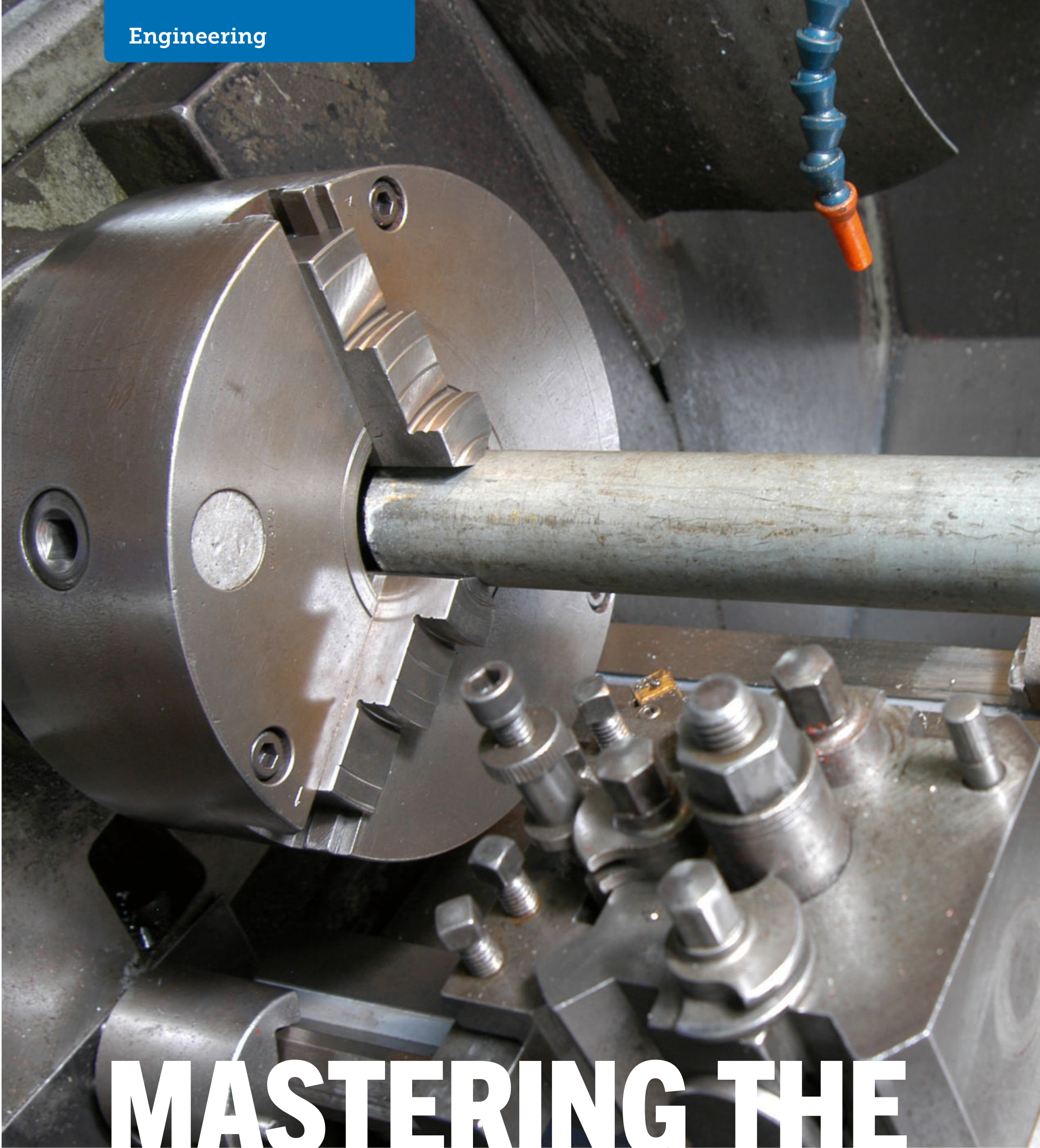
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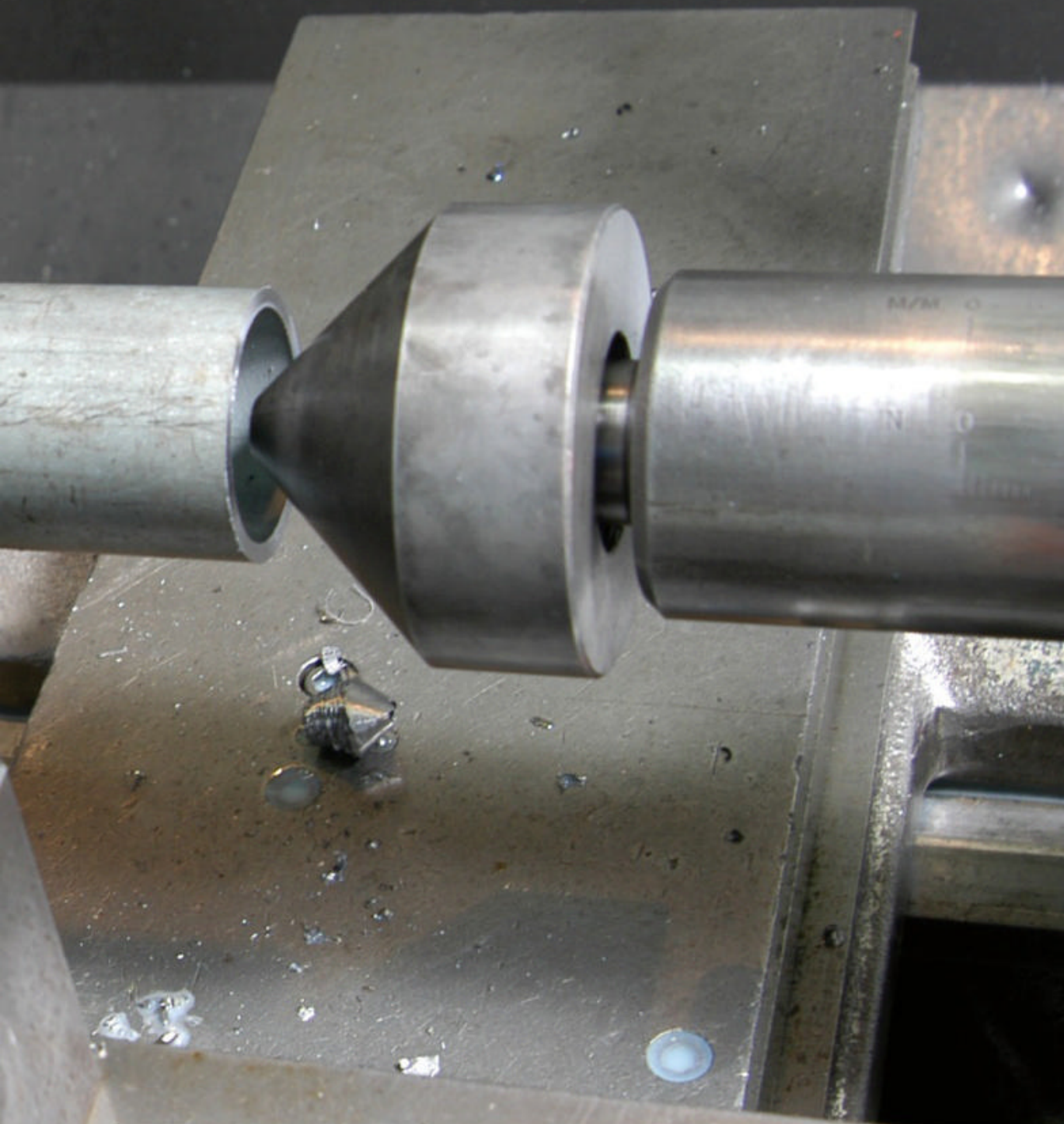


MASTERING THE LATHE — PART 9

MAKE YOUR OWN PIPE CENTRE FOR TUBULAR ITEMS IN YOUR LATHE

By Bob Hulme Photographs: Gerald Shacklock

Pipe centre (right) supports pipe for turning — a pipe centre is a conical section that rotates on sealed bearings set on a Morse taper held in the tailstock



Sealed bearings fitted to stepped diameters

A live centre or dead centre that fits the tailstock of your lathe is necessary to support solid workpieces. However, you need a pipe centre to support hollow tubular items at the distant end from the lathe chuck. Without this support, a long workpiece may not be rigid enough for a good finish. Sizing may also be erratic as the workpiece is pushed away from the cutting tool. With care, you can meet the challenge to produce a pipe centre as a really worthwhile piece of equipment.

When you need a pipe centre, you might not have time to make it so my advice is to make one ahead of time.

I have drawn a simple design first as I am the sort of guy who needs a clear picture of where I am heading. First, establish the size of the Morse taper in your lathe tailstock. The inset on Morse tapers will give you some background and measurements of the different sizes. In my case it is a No. 4 Morse taper (4MT). The design uses two sealed ball bearings (61805-2RS and 61804-2RS). These are SKF numbers, but are universally recognised and can be crossed over to other brands by your favourite bearing stockist.

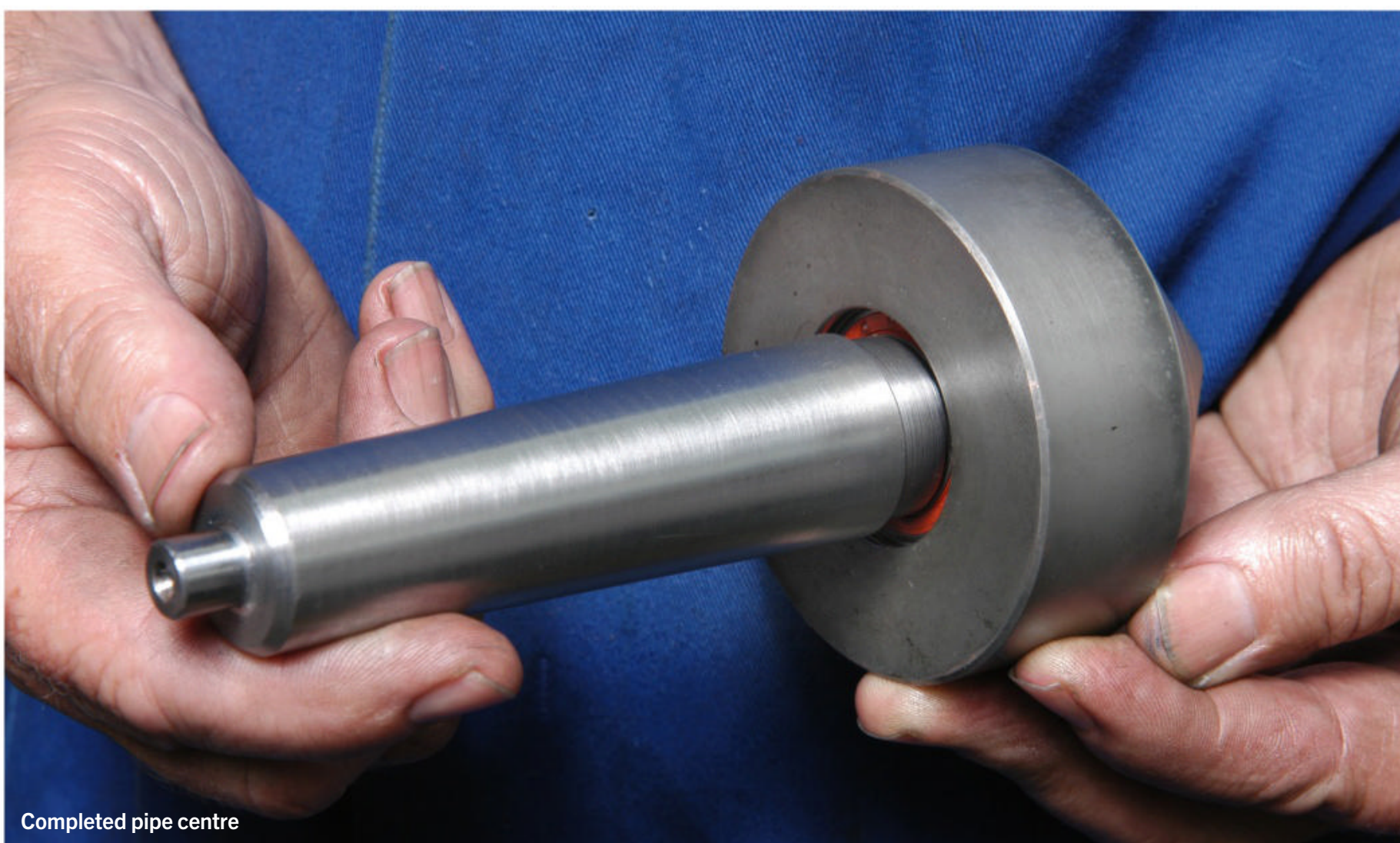
Make sure you use sealed bearings so you need no other provisions to keep cutting oil or coolant out. I could have used plain bronze bearings but they need some clearance for the centre to spin freely. This would reduce support to the workpiece, and as wear occurred this clearance would increase.

Material needed is one piece of steel for the rotating conical part, of 80mm in diameter by 65mm long, and another for the static part, of 35mm in diameter by 120mm long. Your choice of steel type should depend on how often you will use the pipe centre

“With care, you can meet the challenge to produce a pipe centre as a really worthwhile piece of equipment”



Stepped hole in case-hardened conical part ready for bearings



Completed pipe centre

and how much you want to spend. I recommend a high tensile steel such as a 4140 grade for the static part with the Morse taper on it and mild steel for the conical rotating part. Mild steel can be case hardened after all the machining is done to give a hard surface that will resist damage by

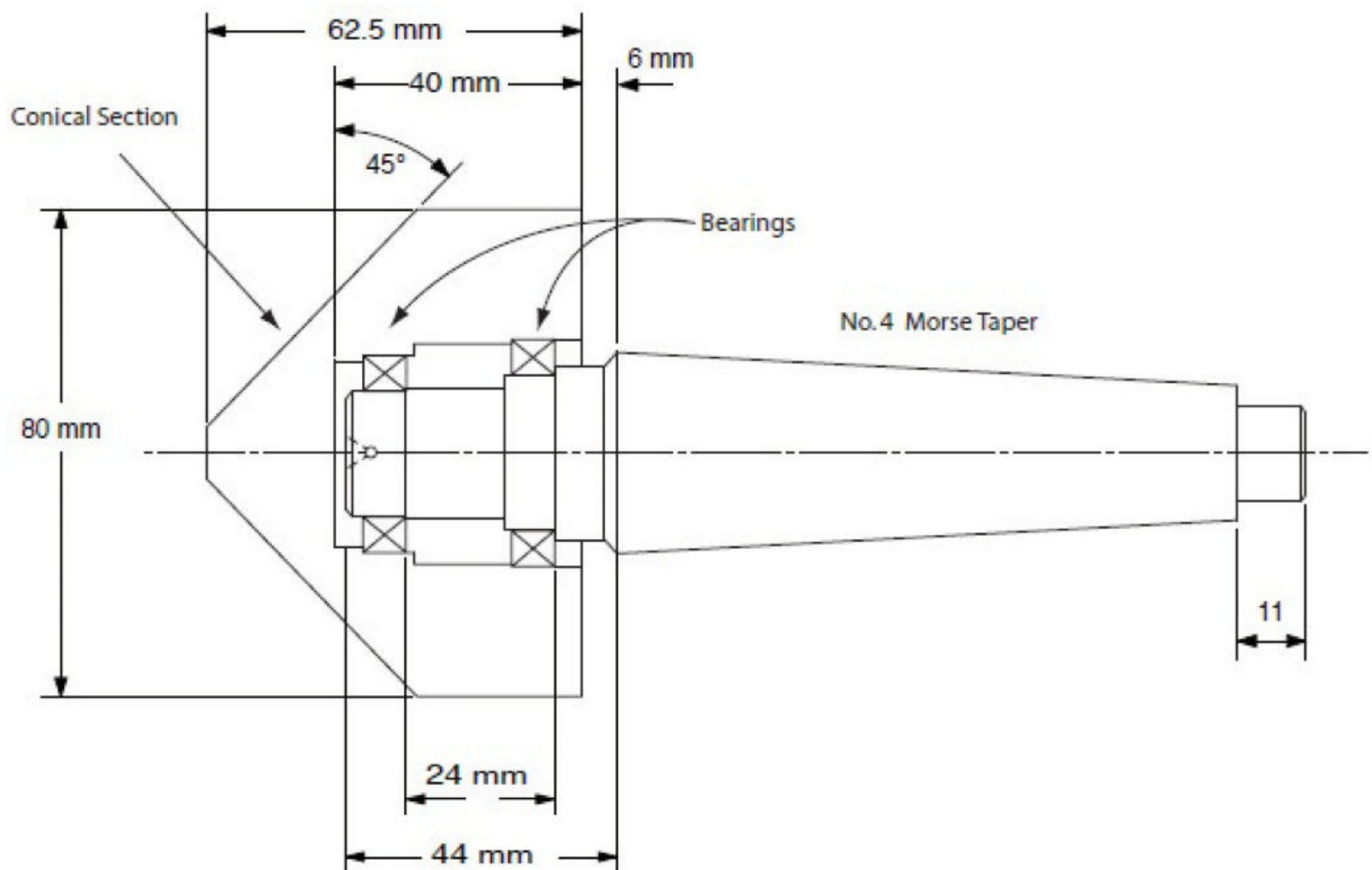
being harder than any workpiece you may use it with. As with all machining projects, it is vital to plan your procedures before cutting any metal.

Important:

The size of the diameters where the bearings fit must be machined to fine tolerances;

The position of the steps that the bearings fit against must be accurate so that the thrust loading is applied equally to each bearing;

For the pipe centre to perform its function properly, the diameters must all be concentric (run true) to each other.



“As with all machining projects, it is vital to plan your procedures before cutting any metal”

Static part

To make the static part, hold the material in the three-jaw chuck. Leave enough protruding to machine the Morse taper and the straight diameter before the first bearing. Turn the material down to a parallel diameter equal to the largest end of the size of Morse taper that suits your lathe tailstock. Machine the small diameter at what will be the small end of the taper. This will be the tongue for driving the pipe centre out of the tailstock.

Next, set the compound slide over to an angle of 1.5 degrees to approximate the angle of the Morse taper. Lock the saddle so that it cannot move along the bed of the lathe, and take



a few cuts along the workpiece using the compound slide. Once you have produced a taper about half the length of the finished surface, use a Morse taper sleeve as a gauge to achieve the exact angle.

Blue paste

Wipe some bearing blue paste sparingly inside the sleeve, then push it lightly onto the workpiece. Take it off again. Where it touched the machined taper, there will be a witness of blue paste. The objective is to see an even coating over the length of the tapered surface.

Achieving this will take a series of slight adjustments to the angle of the compound slide. Take another cut, then test again with the sleeve. To adjust the angle of the compound slide, loosen the clamping screws and give the side of the slide a very light tap with a soft hammer and tighten the screws again. Just small adjustments will make a big difference. If you do not have a Morse taper sleeve the right size, use the tailstock.

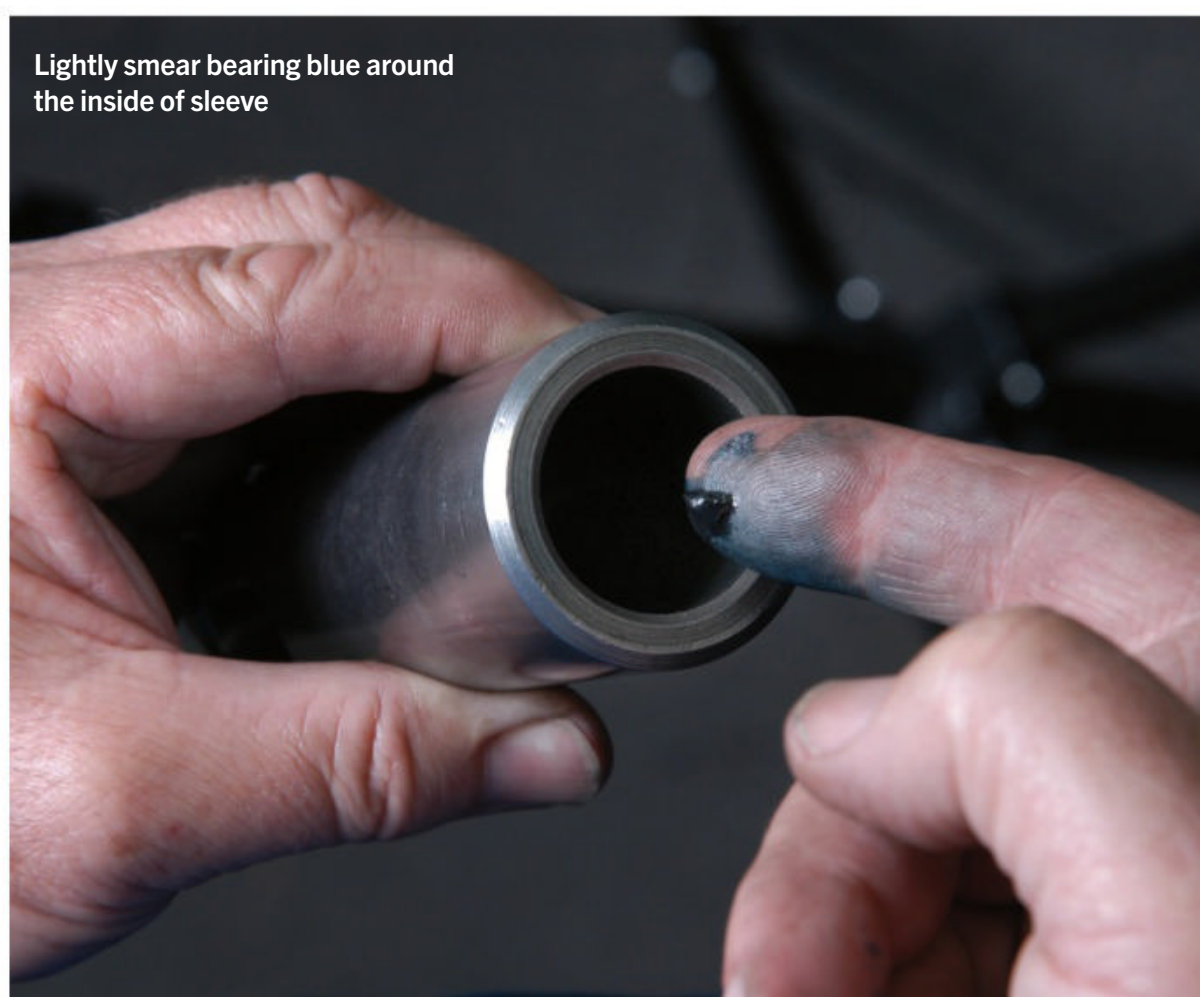
If the blue shows up on the ends but not the centre part of the taper, it is likely that the cutting tool is not set at the correct centre height above the lathe bed. Check this and cut again.

Once the exact angle is established, keep taking cuts along the taper until the sleeve fits on far enough to expose the tongue through the slot in the side of the sleeve. Alternatively, use the gauge line position shown in the diagram about Morse taper dimensions as a point to which a sleeve or the tailstock should slide.

Before removing the workpiece from the lathe, give the tapered surface a polish with either fine emery tape or wet and dry paper. The better the finish, the better it will grip in the tailstock. Machine the diameter that will be between the taper and the outer bearing. Most lathes have a Morse-tapered hole in the headstock spindle and you can make use of this to hold the static part when machining the other end of it where the bearing diameters are. You will need to remove the three-jaw chuck to access this.



Winding slide to take small-angle cut



Lightly smear bearing blue around the inside of sleeve



Check angle with Morse taper sleeve — sleeve should fit on so that the tongue is seen through slot



Blue 'witness' for checking even cut

If you cannot do this with your lathe, you will need to machine the bearing diameter's end first by holding the workpiece in the three-jaw chuck and then holding on to those diameters in a four-jaw chuck to machine the taper.

The four-jaw chuck allows you to 'clock' the already turned diameters using a dial test indicator (DTI) to get the workpiece running true before machining the taper. This way, the taper and the bearing diameters will

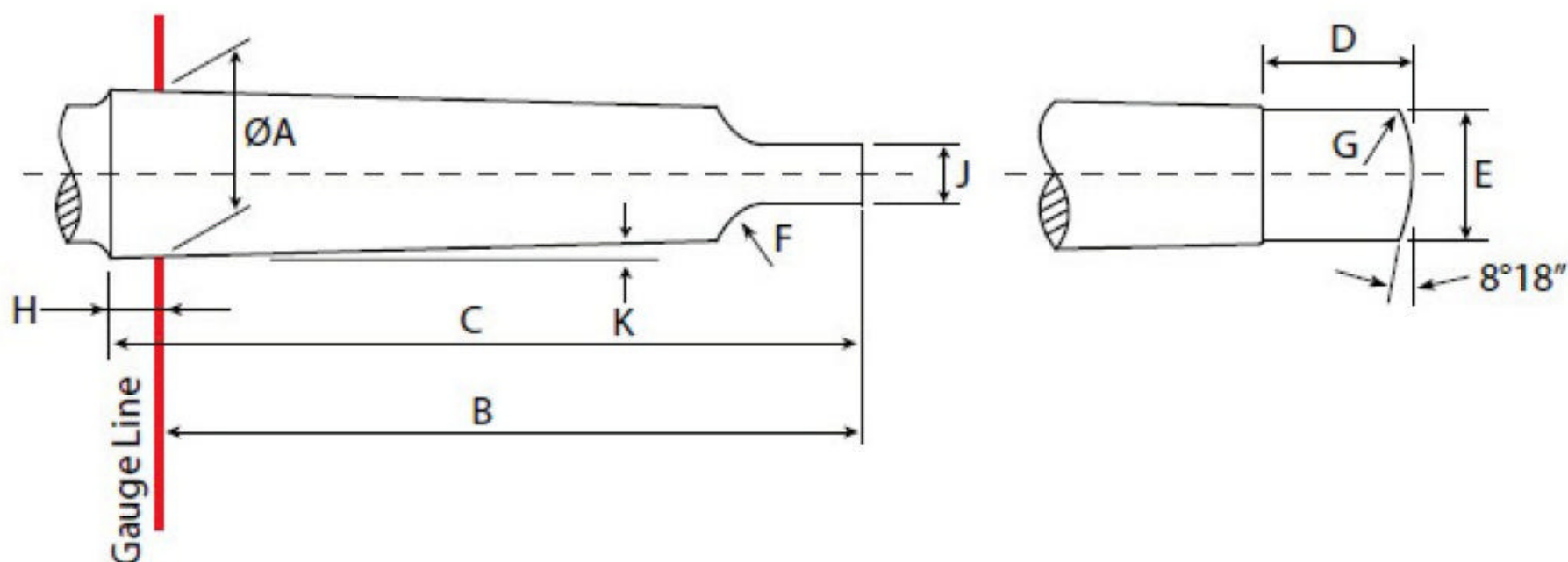
be concentric. This procedure has been described in an earlier article in this series. The four-jaw chuck will also be handy when making the rotating part.

Rotating part

Start making the rotating part by holding it in the three-jaw chuck and taking a facing cut across the end of the workpiece to provide a clean flat surface. Now, take it out of the chuck, turn it around, and clamp it up again with the newly machined face against the face of the three-jaw chuck. This will make sure the material will not tend to move or clamp up askew. If you have a fairly small lathe, you may need to grip this workpiece with the reverse jaws fitted to your three-jaw chuck.

The important thing here is to be sure that, when putting either normal or reverse jaws into the three-jaw chuck, you check the numbers on the jaws and be sure to put only No. 1 jaw into the No. 1 slot, etc.

Take a cut across the face as for the first end, to clean away any saw marks



Morse Taper dimensions (mm)											
Morse Taper number	Taper	A	B (max)	C (max)	D (max)	E (max)	F	G	H	J	K
0	19.212:1	9.045	56.5	59.5	10.5	6	4	1	3	3.9	1° 29' 27"
1	20.047:1	12.065	62	65.5	13.5	8.7	5	1.2	3.5	5.2	1° 25' 43"
2	20.020:1	17.780	75	80	16	13.5	6	1.6	5	6.3	1° 25' 50"
3	19.922:1	23.825	94	99	20	18.5	7	2	5	7.9	1° 26' 16"
4	19.254:1	31.267	117.5	124	24	24.5	8	2.5	6.5	11.9	1° 29' 15"
5	19.002:1	44.399	149.5	156	29	35.7	10	3	6.5	15.9	1° 30' 26"
6	19.180:1	63.348	210	218	40	51	13	4	8	19	1° 29' 36"
7	19.231:1	83.058	285.75	294.1	34.9	-	-	19.05	-	19	1° 29' 22"

and provide a true, square, flat face, then machine the internal bores for the bearings to fit. To machine these bores, first use a centre drill to make a centre hole, then drill using the biggest sized drill you have up to 2mm in diameter, taking care to go only as deep as is needed. Then, using a boring bar, gradually increase the diameter using successive cuts until the first diameter size of 28mm is achieved. Positioning the steps in the bore in the right places can be done using the stop on the lathe bed to come up to a repeatable place.

Then, with the compound slide set back in line with the bed again, it can be used to 'wind' along the required distance to the next step and cuts taken again up to the stop.

Let me repeat myself here to make the boring operation clearer.

After drilling the hole as much as possible up to 25mm in diameter, use a boring bar to finish machining the bore to size. Bore out to 28mm in diameter for a depth of 40mm. Turn the handle in a clockwise direction on the compound slide until the dial is set to



Turning stepped diameters with part held by spindle Morse taper



Boring out conical section — note stop on rail

zero, making sure there will be enough travel of the compound slide available to wind it back to the outer step. Lock the stop onto the lathe bed so that the boring bar is in the right place for the innermost step in the bore. Bore out to 32mm in diameter up to the step position by feeding the boring bar along with the saddle movement and the compound slide locked.

Unlock and wind back the compound slide until it is a little more than 8mm back from where it was zeroed. Then wind the handle clockwise onto the reading to give exactly 8mm. By following this procedure, the effect of backlash is eliminated. Bore out to a diameter of 35mm. Set the compound slide back again, using the same technique to position the last step 16mm back from the previous one. Then bore the outer part to 37mm in diameter.

Bearings maintenance

While exact sizes in the bores would be ideal for fitting the bearings into, it is best in this case to have them ever so slightly larger so that we have a

Morse taper

It is said Stephen Morse devised the taper system as a way to drive the twist drills he invented because drill chucks had not been invented at that time. When fitted into an identically tapered hole in a tailstock or machine spindle, a tapered drill shank has amazing grip and a lot of power can be transmitted through this purely frictional connection.

In mathematical terms, the slighter the angle of the taper the tighter the grip that can be produced when the two parts are put together with a brisk push. However, we then need to get them apart again without too much trouble.

Back in the 1860s, Morse settled on a taper of approx $\frac{5}{8}$ -inch per foot (15.8mm per 304.8mm) as the best compromise to give excellent grip yet be relatively easy to separate. Today, this is still the most popular system internationally for manually operated machine tools.

Another once-popular system was the taper made by machine tool builders Brown and Sharpe, although today it is almost unheard of.

CNC machine tools generally use an NT taper system, which is a much steeper

Morse taper and conical section for pipe centre



taper. It is used in conjunction with a mechanical means to keep the taper pulled hard up into the tapered spindle hole as it will not self-lock. This works best with machines that have automatic tool changers.

Morse tapers come in eight sizes, ranging from the smallest, No. 0, to the largest, No. 7. The actual angle varies slightly from size to size, presumably because standard pieces were less accurate back in the 1860s. The table elsewhere in this article shows the main dimensions.

The tongue at the small end is purely for driving the tapered shank tool out of the tapered socket with a wedge-shaped drift.



Check diameter with telescopic gauge

firm slide fit between the bearing and the rotating part of the pipe centre. A press-fit onto the static part is fine. My reasoning here is that at some stage in the future it may be necessary to renew the bearings.

Over the years, I have experienced

“Over the years, I have experienced equipment designed without any regard to how it would be maintained”

Bob Hulme machining a job using the pipe centre



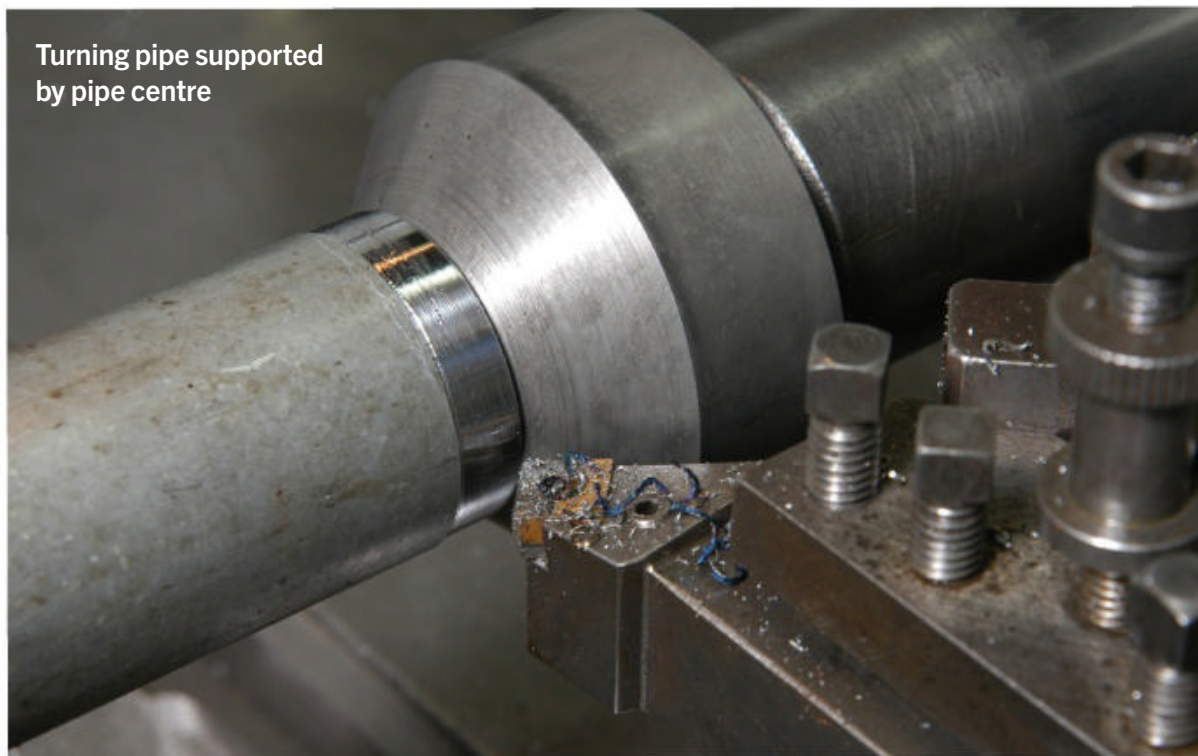
equipment designed without any regard to how it would be maintained. I once had a Mk1 Jaguar — I think it had me — and it always needed something attending to under the bonnet. I was convinced the designer had gone out of his way to make maintenance as awkward as possible. For maintenance, if the pipe centre comes apart with the bearings stuck on the static part rather than on the rotating part they will be easier to remove.

If you are going to get this mild steel part case-hardened after machining, it is best to machine the bore just a wee bit larger because the case-hardening process can cause the metal to 'grow'. This has the effect of making outside diameters bigger and inside diameters smaller.

My guess for this one would be to go for sizes of 32.05mm and 37.05mm where the bearings fit. Don't even think about using your vernier calipers to measure these bores. You will need telescopic gauges and a 25 to 50mm micrometer.

Before removing the workpiece from the chuck, take a light cut off the outside diameter. This will give you a

Turning pipe supported by pipe centre



surface that is exactly concentric to the bores you have just machined and that can be used to 'clock' on when setting the part true in the four-jaw chuck. Then you will be ready to do just that.

Once it is clocked up in the four-jaw chuck with the bores facing in towards the headstock, you are ready to machine the conical shape. Set the compound slide around to 45 degrees and start taking a series of cuts until you are left with a flat area on the front face that is approximately 12mm in

diameter. Get the best finish you can from the turning tool, then spin it up with some fine emery tape to create a smooth finish and to knock off the sharp corners.

It is always wise to do a check of sizes before sending a part off for heat treatment as it is too difficult to make changes later.

With all parts finished you can assemble your new pipe centre and you're ready for action. Aah, do you feel more centred already? 🏠

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PART 4

IT'S TIME TO TAKE A LOOK AT THE MAGIC THAT MAKES IT ALL WORK

By: Enrico Miglino

Photographs: Enrico Miglino



The magic

Before working on some new components to improve the camper van, it's time to take a look at the magic that keeps alive the hardware I presented in the first three instalments of this series.

In this fourth episode of “Enrico on the road”, we forget the tools on the bench and dive into the Linux world.

The bare sources are available on GitHub: <https://github.com/alicemirror/JanTheVan> — explaining the logic and principles behind the internal network. In the next episode we will complete the software components, including the control panel interface.

The software architecture

The core of the camper van electronics focuses on four Raspberry Pi 4Bs; the software development has been in the Raspbian Linux environment — the Debian version of Linux specific for the Raspberry Pi.

“To achieve a good result, I spent a lot of time refining the design and the interaction approach”

The software architecture follows two different workflows:

Internal: Components and applications require a little programming. These components achieve network stability and the connection between the four devices. These also include the hardware — e.g. cameras — directly controlled by the Raspberry Pi.

Interface: Software to manage settings, configuration, and data monitoring of the system through two Raspberry Pis — the router and the dashboard control panel — supporting the user interaction with the whole system.

Different levels of complexity

We can identify two levels of complexity. The most difficult to manage components are those that set up the Linux environment and behaviour. Luckily, we will use programs already available as Open Source in the Raspbian OS repositories. Not easy but not impossible, this part will be a question of installing the right ones and configuring them properly.

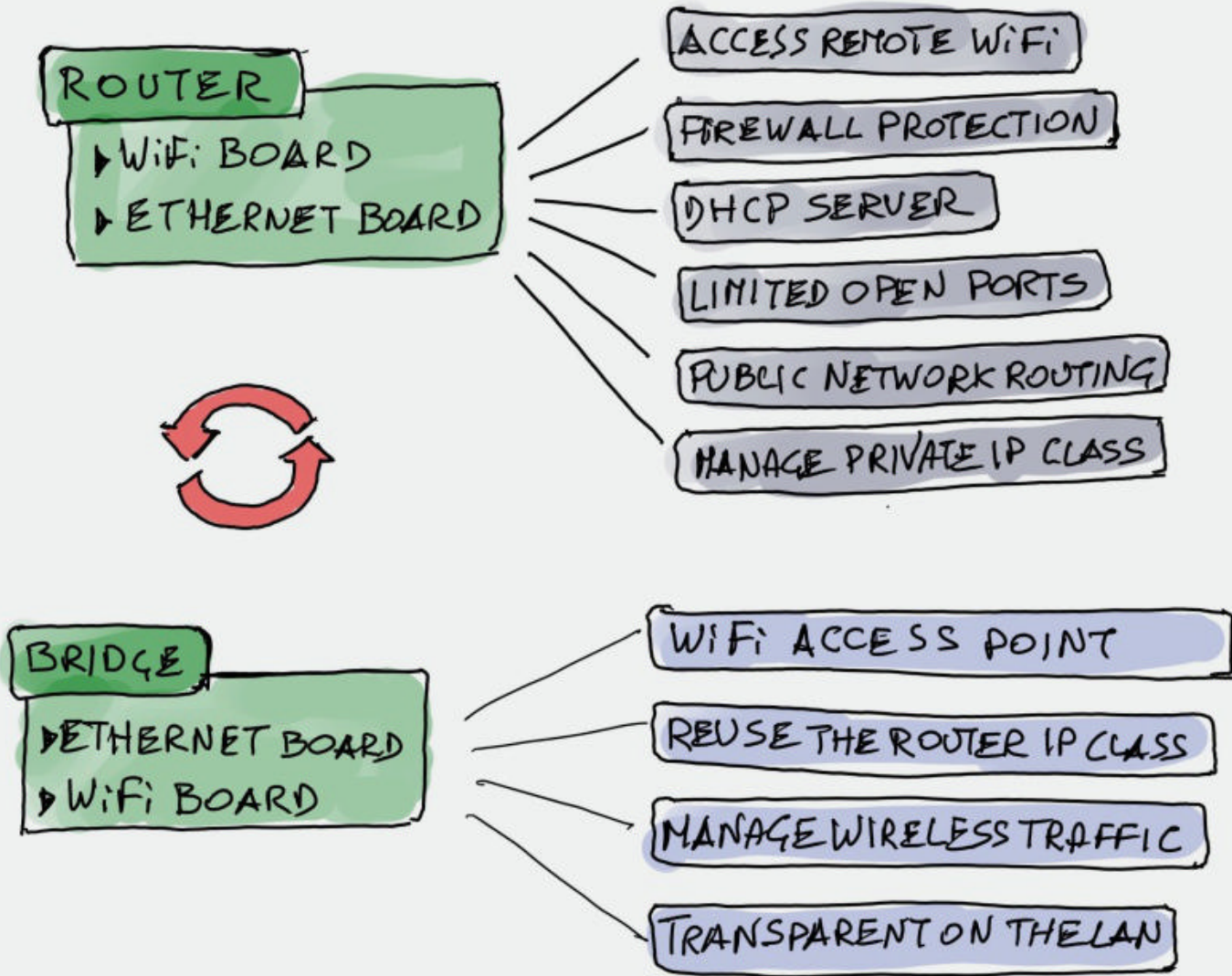
To create the right network and install the front and rear camera devices, some simple Bash scripts to automate certain operations are just what we need. ▶

TIP: Bash — Bourne again shell — is the C-like Linux scripting language used to create a batch of commands to be run in the desired order. It is possible, for example, to write a Bash command to power off all the Raspberry Pi devices connected to the network from a single machine.

The image shows one of the assets I am using while working on the road while travelling in my camper. Besides the eight hours using my Windows 10 laptop while working remotely as a consultant, I also work on my MacBook Pro for photo and video editing. With the help of the computer, I play my electric guitar to make soundtracks then digitally edit them. These are on top of all my other activities and pastimes — plus, of course, writing articles for *The Shed*.

With the availability of a stable network, I can easily switch to different kinds of devices to share data — a MacBook Pro, an iPad, and a Windows 10 laptop are essential factors in working fast and securely. The wall-mounted monitor is also good for viewing internet-streaming channels and music.

I also need some wired Ethernet access ports to the network, as devices such as microcontroller boards do not always include WiFi in the hardware



BASH SCRIPT

- LINUX COMMAND
- LINUX COMMAND
- LINUX COMMAND
- ...

BASH SCRIPT + BUSINESS LOGIC

\$ VARIABLES

COMMANDS

LANGUAGE WORKFLOW

BASH SCRIPT + OTHER LANGUAGES

- ▲ JAVA
- ▲ JAVASCRIPT
- ▲ PYTHON
- ▲ ...

This scheme shows the software architecture for the two core Raspberry Pi 4B computers. Every device uses a few resources to control and secure the network. The configuration, with the addition of a six-port Ethernet switch — two ports reserved to the Raspberry Pi — exposes both a WiFi access point and four Ethernet ports for wired connections.

The processor power of the Raspberry Pi router is shared with the User Interface application, giving the user a series of informative screens, together with a configuration menu

Two kinds of interfaces

When all the network architecture is configured and tested, the second part of the job is the creation of two kinds of interfaces: the dashboard control and the main control panel. Best practice suggests using the same tools and graphic style for both interfaces.

From a technical point of view, this part is easier to develop and test; on the contrary, the user experience and the interaction with the system require a considerable amount of software. To achieve a good result, I spent a lot of time refining the design and the interaction approach.

The Linux configuration and operating system changes joined to the user interface are two halves of the system. For this reason, I split the software just following the way I developed it: we will see first how to set up the system and configure the networking. Then we will learn how I have designed and realised the touchscreen user interface.

“A mobile router can be the solution; however, not for more complex activity”

One by one, four Raspberry Pis

Four Raspberry Pi 4Bs means four powerful Linux machines; they can easily manage the whole network of sensors, as well as an internal WiFi and a couple of cameras. Here we focus on the two that make the core of the camper van network.

The premise for creating a good network on the camper van, able to serve more devices, is the availability of an access point we can configure and eventually design according to our needs.

To achieve this goal, I have used two Raspberry Pis. ‘Pioutside’ acts as a WiFi to the Ethernet router; ‘Piinside’ works as the internal network bridge, access point, and DHCP (dynamic ▶



Raspberry Pi 4B

host configuration protocol) server. These two devices connect through the Ethernet cable using a network switch.

The resulting configuration exposes a local WiFi network — I named it PiLan — to which it is possible to connect multiple devices, such as PC, tablet, smartphone, etc. For a faster connection, the devices that support — e.g. the laptops — can also be wired through an Ethernet cable to the switch ports still available.

Nowadays, the market offers cheap WiFi routers that apparently can replace a project like this with less hardware — and maybe at a lower price. To receive emails with a laptop or a tablet, contact friends, and stream TV, a mobile router can be the solution; however, not for more complex activity.

Advantages of a dedicated network

Many of us are working from home these days. Combining smart-home working and the mobility offered by a home on wheels is priceless for many. Remote working does not always mean writing articles on your blog, posting photos on Instagram, or making YouTube videos. Smart working does not include doing jobs here and there on the road.

Working remotely for a company has limitations if we can't connect to an ADSL or fibre-optics network. For example, we might need to connect multiple devices on the same network or access company-secured resources through a VPN. To do this, we need more than WiFi access or a mobile router; we require a minimum network infrastructure running inside the work environment. The most remarkable advantages of a dedicated network running in the camper van are those I focused on designing with the two Raspberry Pi network architecture:

- The camper LAN is always available, even when there is no internet connection.
- Besides the dynamic IP assignment (DHCP), it is possible to set up static IP addresses for some devices.

“Working remotely for a company has limitations if we can't connect to an ADSL or fibre-optics network”

- It is possible to connect the devices through WiFi or Ethernet cable. Some hardware only supports the wired network connection.
- All the devices always connect to the same network credentials and IP address pool regardless of the internet connection. This is an important feature when it is mandatory to use static IP addresses.
- Using internet access only when needed while the network is still available can save a lot of mobile data.
- When driving, we take advantage of the wireless connection between the camper sensors and devices, e.g. front and rear cameras.

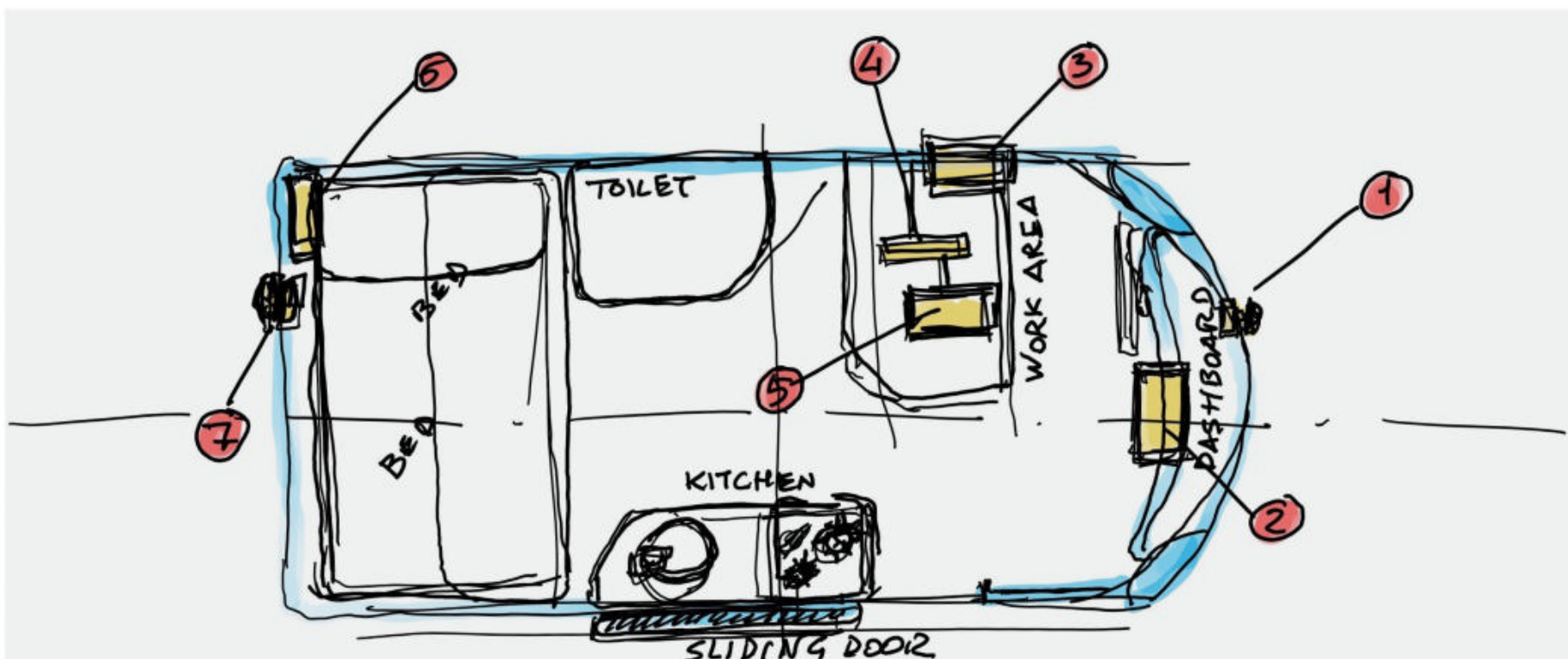
Pioutside: the router

The role of this Raspberry Pi is to be able to connect to the internet through WiFi access and — with proper network protection — share the internet through the Ethernet. It is possible without adding any extra component, and the Pi 4B provides both Ethernet 1Gb and 2.4GHz and 5GHz WiFi board. Thanks to the two physical network ports — the WiFi and the Ethernet — it is possible to protect the internal LAN configuring a firewall; this configuration is more efficient than those based only on a software service using a single network interface.

TIP: Before starting a new installation or setting the Raspberry Pi for a new configuration, always use the following two commands to be sure that your system runs the most recent version of the Linux components:

```
$>sudo apt update
$>sudo apt upgrade
```





The backbone architecture of the camper van is supported by four Raspberry Pi 4Bs. The front and rear cameras connect through the camper van WiFi to the router and the bridge. This means that all the units can communicate and share their data regardless of the availability of the internet. The router covers the role of the control panel, collecting status information and remote data from the two rear camera devices, which also operate as independent units with their mass storage

- ① FRONT CAMERA
- ② FRONT PANEL/FRONT CAMERA
- ③ CONTROL PANEL/ROUTER
- ④ SWITCH
- ⑤ BRIDGE
- ⑥ BACK PANEL/REAR VIEW
- ⑦ BACK CAMERA

Creating the router

A valuable tutorial on creating a WiFi router in a Raspberry Pi is available at: https://linuxhint.com/raspberry_pi_wired_router/

It is not a matter of installing software or a dedicated framework, but a specific configuration of some features already available in the Raspbian Linux OS.

As shown in the example below, the WiFi configuration to access the internet is made directly by modifying the `wpa_supplicant.conf` file that can be found in the `/etc/wpa_supplicant` system folder.

```
ctrl_interface=DIR=/var/run/wpa_
supplicant GROUP=netdev
update_config=1
country=US

network={
ssid="The WiFi access point
name"
psk="The WiFi password"
}
```

This means that the WiFi configuration through the top bar of the graphic interface is no longer available. It is possible to describe multiple WiFi access point networks, from where the system will choose the one with the best signal.

“When set up as a router, the Raspberry Pi works just like a home router”

To enable the use of the `wpa-supPLICANT` as described, the WiFi `wlan0` configuration file (available in the system folder: `/etc/network/interfaces.d`) should be set to use the `wpa-supPLICANT` file:

```
allow-hotplug wlan0
iface wlan0 inet dhcp
wpa-conf /etc/wpa_supplicant/
wpa_supplicant.conf
```

The most recent versions of the Raspbian Linux available on the Raspberry Pi 4B also support the IPV6 protocol — the longer internet IP addressing mechanism. If problems persist after setting up the WiFi connection, disable the IPV6 protocol as the camper van network uses only the traditional IPV4 IP addressing convention. With the command launched from a terminal session:

```
$>ifconfig
```

check if there is an IPV6 configuration active on the `wlan0` session. To disable it, edit the system file `/etc/sysctl.conf` with the command:

```
$>sudo nano /etc/sysctl.conf
```

adding to the end the instruction to disable the IPV6 protocol at boot:

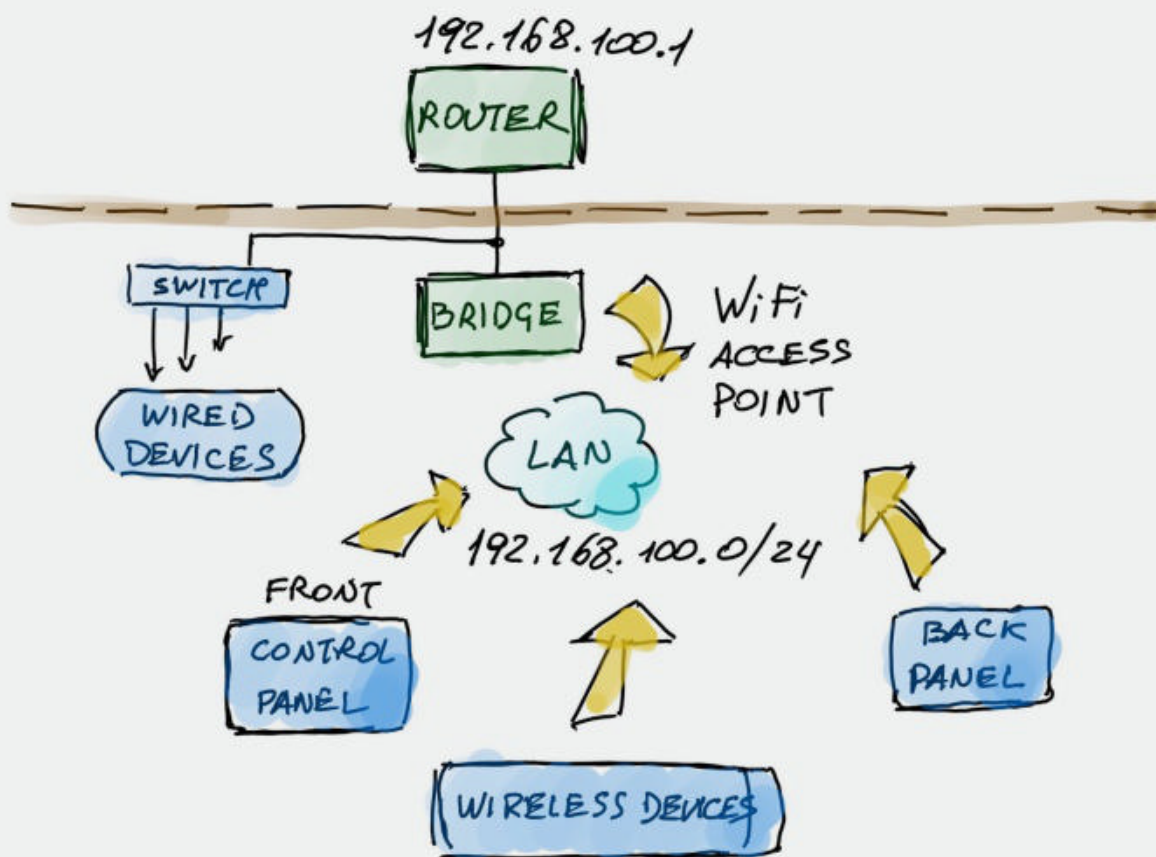
```
net.ipv6.conf.all.disable_ipv6=1
net.ipv6.conf.default.disable_
ipv6=1
net.ipv6.conf.lo.disable_ipv6=1
net.ipv6.conf.eth0.disable_ipv6
= 1
```

Then add at the end of the file `/etc/rc.local` the command:

```
$>sudo nano /etc/rc.local
$>service procps reload
```

After reboot, your IPV6 Internet protocol should be disabled.

When set up as a router, the Raspberry Pi works just like a home router, and includes a DHCP server that can provide automatic IP address settings for other devices connected to the network. ►



This scheme shows how the internal network — available to all the connected devices — relates to an external connection when available.

One of the advantages of this internal network configuration is the possibility of sharing the resources of several devices locally. Working with different devices while on the road may not always require an internet connection. When connected to the internet, sharing local data can be easier and save mobile data. It also has the bonus of being faster

To give the network connectivity to the Pi-internet router, connect the Raspberry Ethernet port with an RJ cable to a multiport switch. This is a limitation as many of the devices need to access the LAN through a wireless port instead of the wired one provided by the Raspberry Pi. The second board can solve this limitation and complete the base of the camper van LAN configuration.

Piinside: the bridge

Setting a bridge in the Raspberry Pi is easier and the second device can provide resources for other tasks without difficulty.

A good tutorial to configure the second Raspberry Pi as a WiFi bridge can be found at the following address: <https://www.raspberrypi.com/documentation/computers/configuration.html>

The task of the bridge is not just to carry out the opposite process of the router; the network bridging technique has the advantage that the devices connected to the bridge use the same group of IP addresses as the router.

TIP: In the examples we are using, the group of addresses ranges from 192.168.100.0 to 192.168.100.255.

The 256 IP addresses from 192.168.0.x to 192.168.255.x are considered reserved. This means that these addresses can be used to configure private LANs as no internet device is likely to have one of these IP addresses.

For our LAN we have used the group of IP addresses starting with 192.168.100 because it is almost impossible to find a commercial device — router, access point, etc. — that uses addresses higher than 192.168.5.x

Bridge installation in two steps

To install the Raspberry Pi bridge, follow two steps:

Install the access point software — this gives access to the WiFi external devices to the LAN.

Configure the Linux machine as a network bridge — this

gives access to the internet through the Raspberry Pi router to the connected devices.

The access point package — which can be installed from the terminal — is `hostapd` and is available in the public repositories of the Linux Raspbian:

```
> sudo apt install hostapd
```

The bridge does not need any additional package as it is only a matter of setting a special network configuration. For details, follow the instructions described in the tutorial mentioned.

“For our LAN we have used the group of IP addresses starting with 192.168.100”

Adding a switch

To make the camper van network fully functional, another piece of hardware is required: an Ethernet switch.

Depending on the number of devices you plan to hard wire — instead of connecting through the WiFi — you can choose a switch with more or fewer available ports. I have used an eight-port switch — these devices are easy to find online. Two ports are dedicated for wiring the two Raspberry Pis — the router and the bridge — and six are available to connect other devices.

When the two Raspberry Pis are up and running, all the devices can be connected — WiFi or Ethernet — to share their internal resources, as well as to access the internet when it is available. 📁





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CARVING OUT CREATIVITY

A YOUTHFUL HOBBY HAS BECOME A LIFETIME PASSION FOR A
MASTER BONE CARVER

By Helen Frances Photographs: Hanne Eriksen Mapp

Owen Mapp in his studio with granddaughter Fern



When master bone carver Owen Mapp, CNZM, began carving bone and ivory in the 1960s there were no teachers and no bone carvings being sold commercially, so he had to learn just by doing it.

“I was the first one. There were a few jade carvers but nobody was interested in the materials then and I had the field to myself,” Owen says.

He has developed his practice and passion for the art form over 50-plus years, creating original works that are strongly influenced by Māori history, concepts and design; as well as Scandinavian, Asian, and Japanese netsuke designs, symbolism, and traditions.

His carvings have a palpably sensual, at times erotic quality, an expression of his reverence for life in its myriad forms.

“I believe in the magic or spirit of carving. I create objects to be handled or fondled while on the body, not just to be seen.”

*“I believe in the magic
or spirit of carving.
I create objects to be
handled or fondled
while on the body”*

Maori mentors

Owen began bone carving at a time when attitudes towards non-Maori using Maori motifs were different, and there was less overt controversy. He found mentors who passed on knowledge about Māori worldviews (te ao Maori), kaumatua such as Selwyn Hovell, Bill Kerekere, and Pine Taiapa.

“Today about 70 percent of my clients are Māori, who often ask me to follow an iwi style of carving. But even my own style is perceived as 'Maori' by some.”

Owen’s pioneering, aesthetic contribution to professional bone carving in New Zealand was officially recognised in 2019 when he was

awarded Companion of the New Zealand Order of Merit for services to Māori carving and bone art. He pays tribute to the many bone and jade carvers who have also contributed to the sculptural art form.

Biography in brief

A fifth generation New Zealander with Scottish, Irish, Welsh, and Viking inheritance, Owen grew up in a family of farmers in the Wairau Valley. At the age of 14, encouraged by his mother, he took part in a dig at the Wairau Bar, an important early Māori archaeological site. He later worked at the Canterbury and Dominion Museums where his interest in archaeology deepened, with a particular interest in stone tools. Aged 18, after having “bombed out badly” in School Certificate at boarding school, Owen went overseas and worked at a museum in Sweden, also at the British Museum, and at Masada in Israel. He travelled widely in the 1960s and when he returned home he tried to get work



Hine nui te po, Great Woman of the night. Whale bone, paua, horn

the Chatham Islands. He continues to pass on his skills and knowledge through the Mokau Bone Carving Symposium every Easter in Taranaki, and informal one-on-one workshops at the home in Paraparaumu he shares with wife Hanne Eriksen Mapp, a well-known jeweller, potter, and the photographer for this article.

He says he sells beginner bone carvers a couple of tools to get them started, then tells them to go away and make something, “and when you've made something come back, then we've got something to talk about”.

“However his School Certificate results again proved a stumbling block, and he took up bone carving as a hobby”

Influences and inspirations

Owen's work is influenced by his strong interest in artefacts from around the world, especially those from Aotearoa New Zealand. He says he attempts to translate their influences into objects of ►

at New Zealand museums, however his School Certificate results again proved a stumbling block, and he took up bone carving as a hobby, “mainly whale teeth at the time”.

Owen also worked as a set, props, and graphic designer at NZBC and the New Zealand Film unit, developing useful skills for contemporary carving.

Establishing a bone carving career

In 1972 Owen was offered his first exhibition at Wellington's Bett-Duncan Gallery, and sold all his pieces. He continued to develop his career in bone carving and quickly established himself, educating the market through regular exhibitions and workshops.

Owen taught bone carving part-time at Whitireia Polytechnic for 29 years and tutored on the Moriori marae in



Nguru flute, whale ivory

Bone carving process



Owen uses a range of bone, tusks, and teeth, however for beginner carvers he recommends cow leg bone, which is solid and reasonably thick, inexpensive, and available from supermarket butcheries, farmers, and home kill.

Cow bone is hard and rather brittle, whereas deer antler is softer, fibrous, more flexible, and breaks less easily. There are eight antlered species of deer in New Zealand.

Emu is quite brittle — he uses this along with ostrich leg bones for flutes; and makes small carvings out of tagua nut, or vegetable ivory — a legally available material that grows on palm trees in South America. Whale bone, theoretically, is flexible, he says, and harder to come by.

Mammoth bone, 40,000 years old, can be legally imported from Alaska, Canada, and Russia. A solid lump of good-quality mammoth, with no delamination or cracks in it, could cost today \$300-400 per kilo, he says.

However, “If it's really rubbish, mammoth ivory suitable to make just small pieces of jewellery, maybe \$100 a kilo, if you're lucky.”

1. Material preparation



- Remove the flesh from the bone (cow leg bone, for example), cut the two joints off, so you are left with a tube of bone, and poke out the marrow.
- Boil the bone with some detergent or NapiSan, to remove the remaining tissue such as fat.

Alternatively, “I do about 10 to 12 bones at a time, dig out the marrow and throw them into a bucket of warm water with about a cup of NapiSan and forget about them for several days. The NapiSan pulls any blood staining out of the bone, whereas if you boil it and there's blood on or in the bone it kind of sticks, and stays there.”

- Leave the bone to dry. Once it is dry the cow bone is ready to be carved, just don't leave it in the sun, or near heaters in a hot room as it will crack easily with temperature fluctuations. “Same with deer or ostrich leg bones, keep them away from heat. They don't like temperature change. Whale bone is not a problem. Deer antlers are not a problem.”

Owen doesn't bleach the bone white, as some carvers do, preferring a creamy, natural look.

2. Design and drawing

- Start with an idea for a simple form initially. Inspiration may be found in nature, in the imagery and symbolism of world cultures, in books, museums, galleries, or possibly in the shapes and forms of tools or other objects in your shed.
- Draw and develop the idea on paper to scale until you have the desired form.

Owen's drawing/design books have pages of elegant 2B pencil drawings that demonstrate the evolution of different ideas — feathers, koru, manaia (guardian), taniwha and dragons, bamboo shoots, and Gothic flowing cloth (an idea developed for brooches) are a few examples.

“Drawing to me is critical. You solve a lot of your problems in your workbook.

And of course, the negative space is as important as the





Roughing out with flexi shaft machine, steel burr



Engraving roughed out form



Sanding finished carved form

positive form. If you fail on the negative space your carving just hasn't got it."

He progresses ideas from one carving to the next, changing designs, improving on those that came before. The starting point, for example, might be a traditional Māori fish hook.

"So you copy the first one to get the feel of it and then you move on to fish hooks with manaia figures on the side, and so on."

- f. Cut a piece of bone to the required size. A handsaw or electric band saw is useful.
- g. Prepare the surface to be carved using a rasp or coarse sandpaper.
- h. Transfer the design in pencil onto the exterior side of a piece of inexpensive bone such as cow or deer antler.

3. Carving tools to use

Owen uses 40 to 50 different tools and makes others as required. Initially he carves using gravers with wooden bulb-shaped handles that fit in the palm of the hand, and also Japanese-style tools with a pen grip, rasps, files, needle files, or jewellers' files that can be obtained from Regal Ltd in Auckland.

"They're mainly jewellery tools and you can buy a cheap six

or 12 pack at Bunnings, which is a starting point. You find out what suits a particular aspect of the carving pretty quickly once you start."

- i. Rough out the design making deep, roughing out cuts with a flexi shaft electric drill. Drill holes in what will become the negative space to let the hand tools in.
- j. Begin carving using hand tools such as various sizes of graver, pushing with the point to make cuts and then scraping with the side of the tool using either side. Owen's particular style makes a disappearing cut, so the bottom of the cut is not visible.

To smooth the edges and make a rounded surface, use files and needle files from inside the negative space.

"It's never a flat 2D piece because I'll carve both sides. The design will usually go around the edge in some way. For me that's vitally important because with a lot of bone carvings you see in New Zealand you get a lovely front then you turn it over and it's just a machine cut flat back. Of course, you get disappointed when you see that so what I'm doing is giving you a surprise all the way around, so it makes you turn the object."

4. Finishing

- k. When the carving is finished, sand the surfaces with 220, 440 grit sandpaper.
- l. Polish the carving on a cloth buff with Brasso or white rouge. Clean with warm water and a toothbrush.
- m. Rub in baby oil to restore life and strength to the surface of the bone.

Mammoth ivory also likes a lot of oil when carving is finished, and if by chance a legal piece of elephant ivory is sourced, the material is very sensitive to temperature and humidity and also likes to be well oiled.



Sketchbook and finished carvings



Metamorphosed design and carving process



Danish Neolithic flint gravers
Maori pre-European jade gravers/chisels
OM's tool steel graver



Fly by Bone, netsuke. Mammoth ivory

► today's world, giving them a timeless, lasting quality to be enjoyed now or equally in a thousand years' time.

He sees himself as a South Pacific carver, influenced directly by his culture (Māori and Pakeha) and surroundings.

"I look back to the ancestors. If you don't know your past, how can you know your future? My philosophy is holistic. If I am working with any bone or ivory I like to know the animal it is from and its surroundings. If you know that from an archaeological point of view, you can read the bones."

He quotes Brian Flintoff, an acclaimed New Zealand artist and carver, saying, "I feel my work as a non Māori working with Māori forms becomes validated because my carvings are used in traditional settings and to honour the ancestors. They become true taonga, fashioned with aroha [love] and imbued with wairua [spirit]."

"He says he sells beginner bone carvers a couple of tools to get them started, then tells them to go away and make something"

Always on the lookout

Owen's curiosity about ancient artefacts has drawn him into many areas of research in museums and out in the field, fossicking in likely and unlikely places.

"I'm always looking for that forgotten 'treasure' in a dusty corner of a junk shop."

On the day of our interview Owen was wearing a stylised whalebone matau or hook with two manaia (guardian figures) on the side.

"A bone hook is usually perceived as a symbol of Tangaroa [god of the ocean] and may help one obtain a good seafood

bounty," Owen says. "The bone feathers I carve could represent the peace movement of Parihaka, as well as a life force symbol of birds and flight. Many cultures use feathers as various symbols so I leave it up to the individual wearer."

He has carved many feather brooches, bringing out the different characteristics of every feather, but after tiring of that began thinking more in 3-D, carving feather bundles out of whale bone.

He followed another progression with the koru, which, while it may have specific cultural meanings for Māori, is also a universal symbol of creation, growth and potential — a shape found in nature the world over.

"The koru shape is not just Māori. I've found koru decoration in English cathedrals and you'd swear some Polynesian had carved them but they're 11th, 12th-century British. So fern fronds, koru, spirals, tendrils — you've got endless varieties." ►



Bone from sea mammals — whale, seal, etc



Everybody in New Zealand has the right to apply for a permit to cut up a whale, Owen advises, however as far as he is aware Pakeha will not be given a permit by the Department of Conservation (DOC).

“DOC hands over stranded whales to the local iwi. So the local iwi gets whatever they want — bone, teeth, maybe oil from time to time. In my case, when I started carving in the late '60s, I could cut up a whale on a beach and nobody took offence. DOC might come past, police might come past, local iwi might come past, and nobody raised any concerns with me. As far as I was concerned, I was rescuing a precious material and honouring the dead whale. So in the '60s and '70s, I was doing this and storing material,

which is still lasting me today. Now the other way you can get whale bone or whale teeth is through public auctions, garage sales, from local iwi, if you’ve got a relationship with local iwi. Local iwi might ask me to carve a taonga for a gift, so I would expect if I’m going to carve a tooth, a couple of teeth in exchange. So I get material that way sometimes.”

He says that if a new carver wants whale material they need to talk to their local iwi and check out different second-hand sources.

“It is legal to pick up a bone or a tooth from a beach, as long as it’s separated from a known, or any whale. You cannot go and cut up a whale, or a seal for that matter.”

Netsuke

Owen carves miniature sculptures, whether they are brooches, pendants, netsuke, knife handles, statuettes, flutes, or boxes so that the eye automatically travels around the piece. Netsuke are six-sided, he says, unlike Western jewellery or sculpture.

“There are curved lines everywhere you look, which is what, in the Japanese sense, is netsuke carving.”

He was introduced to Japanese carving, netsuke in particular, through various New Zealand museum collections. The netsuke is a small sculptural, toggle-type object that anchors personal items such as tobacco pouches, pipes, purses, and decorative stacked, nested boxes called inro, from the obi of Japanese men. The obi is a wide sash worn around the waist of a kimono, but the garment has no pockets. The ornamental netsuke has two holes through which a cord is passed

and attached to the hanging item with a sliding bead (ojimi) to allow the item to be opened. The cord passes underneath the obi and the netsuke sits at the top of the obi.

“The little box hangs down, so the netsuke is functional. It stops the box falling to the ground like an anchor.”

“If I am working with any bone or ivory I like to know the animal it is from and its surroundings”

Netsuke inspiration

Carvers of netsuke drew inspiration from a wide range of sources that included nature, mythical tales, historical figures, theatrical masks, erotica, satire, the grotesque and the humorous. There was

also a great variety of materials used. The most common was wood, including boxwood, ebony, Japanese yew, walnut (and walnut shells), tagua nut, mahogany, and briar tree root. Animal products included tusks (elephant, fossil mammoth, fossil walrus, wild boar, warthog, and others), antlers and horns, as well as bone. Marine products were also used, such as coral and mother-of-pearl, and other materials such as amber, stones, ceramics, metals, glass, and plastic.

In 1989 Owen went to Japan where he further developed his knowledge and skills in carving netsuke, becoming renowned worldwide as a netsuke carver. His work is represented in books and royal collections and since 1990 he has exhibited annually in Japan with the Japan Carvers' Association and the catalogue is distributed worldwide. ►

Collectors

Owen and Hanne's house is full of art works and collectors' items from around the world — African carvings, large ceramic vases made by Hanne, Palaeolithic stone tools, and tiny, intricately carved netsuke figures. Owen also collects weapons such as knives, spears, and muskets, and there is a history to every item. Everything has a story, such as the tiny, whimsical Billiken sculpture sometimes called an 'Eskimo [Inuit] Buddha'.

“It's a made-up name, by a white American woman, who designed the Billikens as a trade symbol for a trade fair in Seattle, in 1906.”

Renowned Inuit carver Angokwaghuk, nicknamed "Happy Jack", was given a Billiken carving, and he carved others, which were very popular. The Billikens entered Inuit folklore with a kind of godlike or good luck status. Inuit have continued to carve the Billiken to the present day.

And then there are collections of antlers and skulls (goat, deer, donkey, thar, African warthog), a mammoth tusk, sperm whale teeth, Ice Age walrus tusks, and moose antlers from North America.

Owen says he is a compulsive collector, and the treasures he collects are of value in many ways — financial, cultural, historical, spiritual, and aesthetic.

“Things like this are research items to influence colleagues and students so I collect for a range of reasons, things that interest me, things that have history, carving techniques that influence me, and therefore influence our students.”





"There's something beautiful about somebody who does what they love to do no matter how misguided and remains optimistic and vibrant against all the odds."

Owen at his studio work bench

Owen uses mainly New Zealand motifs for his netsuke, although some such as the bamboo shoot reference Japanese motifs and symbolism.

“There is endless variety and every one is different.”

Some of his netsuke, carved variously in mammoth ivory, whale ivory, and antler, feature in a recent exhibition of his work (see below).

A baby bird’s head peeps out from inside a feather, called ‘Feather Wrapped Fledgling’, and a blowfly squats on a foreshortened bone that he based on a possum femur.

“The Japanese immediately get it — life and death. A blow fly that lives on death, so I call it ‘Fly by Bone’. It was bought by one of the Japanese royal family princes.”

Other netsuke are loosely based on starfish and shells, ribbon fish, and a resting duck is carved from rewarewa wood and horn. He sometimes collaborates with Hanne on specific pieces that require her jeweller’s skills and creativity, and more of their exquisite work can be viewed at <https://www.art-jewellery.com>

For further information on netsuke visit <https://www.netsuke.org>

“There are curved lines everywhere you look, which is what, in the Japanese sense, is netsuke carving”

Dragons and taniwha — carvings by a master

A recent exhibition of Owen’s work, *Dragons and Taniwha – 50 Years an Artist Carver* has been touring New Zealand, and *The Shed* is raffling the exhibition catalogue elsewhere in this issue.

Two carvings of a taniwha and dragon (Māori and Pakeha) feature on the cover the catalogue — a Shetland Viking Dragon (whale bone, horn, amber, gold) and Taniwha Awarua (whalebone, paua, horn, silver), that references a taniwha of Porirua harbour. The story of her flying exploits can be found at <https://eng.mataurangamaori.tki.org.nz> ►



Whale bone breast plates, Ocean currents



Cow bone



Guardian totem — A. Carr coll.



Koauau flutes

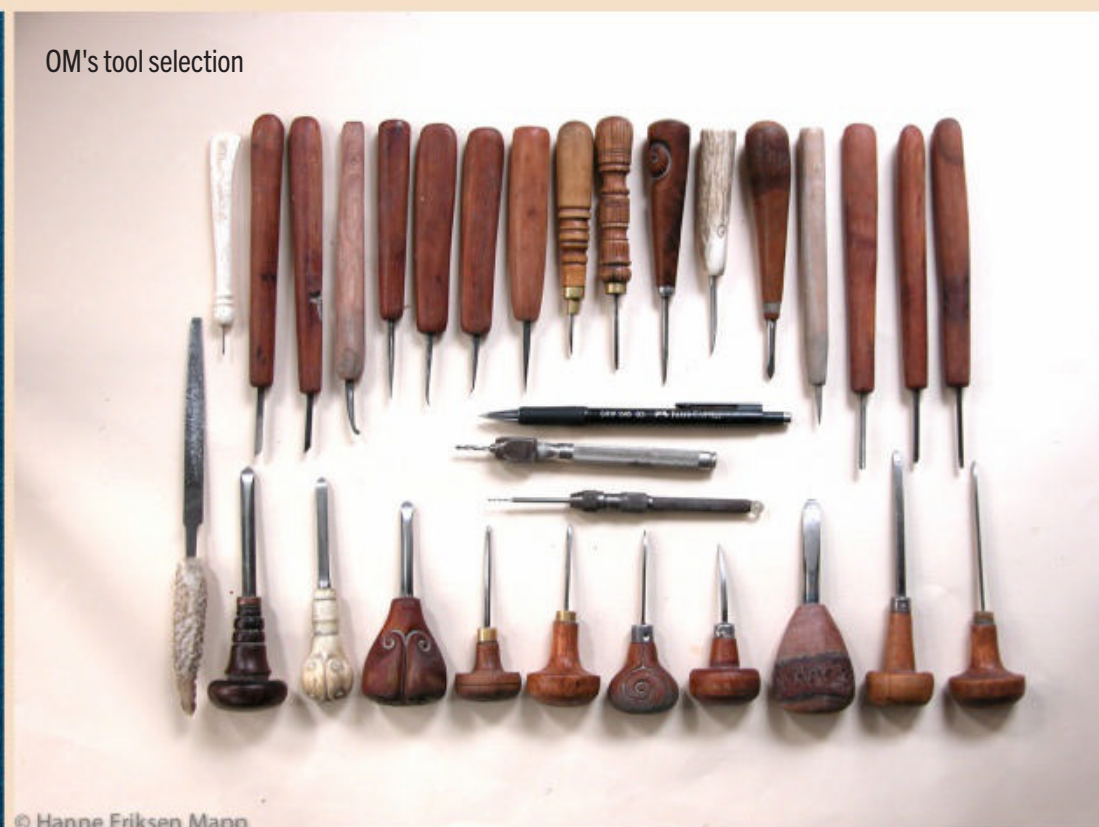


Archaic Maori 'hogback' adzes



Engraved antler using Neolithic type flint tools, kokowai / red ochre rubbed in.

OM's tool selection



© Hanne Eriksen Mapp



Bone cutting on bandsaw



Bone shaping with beltsander

Among Owen's collection are tools from around the world — stone tools from Denmark and Sweden between 10,000 to 40,000 years old, and pre-European Māori tools he found in Marlborough.

Sites were not protected by law when Owen was a young collector, as they are today. In Denmark the situation is different. Artefacts found on the surface may be kept unless they contain precious metals, however a permit is required to dig. Gold and silver artefacts have to be surrendered, however compensation is offered.

"Denmark's been inhabited many thousands of years and the country is about a fifth the size of New Zealand. When a farmer ploughs a field it lies fallow during the winter with snow and then you get the thaw. The earth moves, so all the stones are left on the top plus artefacts that anyone can collect."

A massive pre-European Māori adze of argillite, or indurated mudstone, is one of his prized possessions. "It was used for wood carving and my tools for carving bone are miniaturised versions of this." For Owen the adze is much more than a tool. "There is a man who made it for a purpose. He had to find the right quarry, probably in the Nelson or D'Urville Island area. He chose the material and worked it, so I wonder what he was using it for?"

Among the hundreds of tools he has collected over the years, there are Aboriginal axes, North American Indian skin dressing tools, obsidian knives from Mexico, little flint arrow points from Afghanistan, and a flint axe from around 4000 B.C.

Owen Mapp and Hanne Eriksen Mapp
eriksenmapp@art-jewelry.com

Another carving (whale bone, paua, pearl shell, and horn) in the exhibition combines the two motifs. Owen explains the composition and symbolism.

“It’s a yin/yang composition of a Welsh dragon and a taniwha. At the centre are a feather quill and a wood carving adze [representing peace, education, and cultural richness]. And lest we forget our past history, the taniwha is holding a patu and the dragon is holding a sword behind their backs. We like to think that is past history.”

A selection of other carvings in the exhibition includes Hine nui te Po, Great Woman of the Night (whale bone, paua, horn), Totem Guardian (whole cow bone), South Pacific Ocean Currents (whale bone breastplates), Koru Fronds and Five Gothic Flying Robe Brooches (cow bone).

“When the finished piece is passed around by hand the delight on a person’s face is everything”

The carving life of Owen Mapp

“Carving for me is certainly a passion, I would not be able to stop if I wanted. It is very meditative by nature and once you have absorbed the tool it becomes a routine, allowing your mind to contemplate other designs or ideas. The practice of using a graver has given me absolute control over the material I choose to carve, which in itself is a great sensory pleasure. When the finished piece is passed around by hand, the delight on a person’s face is everything.”

The Shed has a copy of Owen’s exhibition catalogue ‘Dragons and Taniwha – 50 Years an Artist Carver’ to give away to one lucky reader. To enter answer this question. What year did Owen travel to Japan for the first time?

Send your answers to editor@theshedmag.co.nz with Owen Mapp in the subject line. First correct answer received wins. 📧



Upcoming bone carving events



NB: These events may be subject to COVID restrictions. Please check with organisers before attending

Dragons & Taniwha: Owen Mapp Opening 9 April and running through to 17 July 2022 at Te Manawa Gallery in Palmerston North.

Mokau Bone Carving Symposium, Mokau Community Hall – contact Mike Brown <https://www.facebook.com/mokaubonecarving>



LAUNCH A CAREER IN THE MARINE INDUSTRY

Reid Wilson has always enjoyed tinkering around with tools making things, and by the time he was 14 he had his own woodworking workshop, complete with power tools and machines.

“I spent a lot of time researching woodworking on YouTube and reading and buying books,” he says.

Reid heard about the Launch it, School to Work programme, run by the Marine and Specialised Technologies Academy of NZ (MAST), through his careers advisor at Pakuranga College. He decided to investigate apprenticeship opportunities in marine cabinetry.

When he went for an interview at Lloyd Stevenson Boatbuilders (where he is currently doing his apprenticeship) and learnt they weren’t offering cabinetry apprenticeships at the time, Reid (19) decided to give boatbuilding work experience a shot. “I soon realised that I enjoyed this just as much. There are a huge number of skills to be learnt in boatbuilding, with such a variety of work.”

He is currently completing a NZ Certificate L 4 in Wooden Boatbuilding and a NZ Certificate L 4 in Composite Boatbuilding, and intends doing a third apprenticeship in Marine Interiors.

“The thing I enjoy most about my job is the variety of work and skills, the

teamwork, and the high level of quality required to produce a good boat,” he says.

“Some of the challenges are solving issues on the job, and making the working process as safe and healthy for me as possible by taking the right precautions and using PPE.”

In his final year of high school, Year 12, Reid took English, maths, chemistry, construction, allied trades (CAT), and product design.

He says CAT and product design have been the most useful subjects as they taught him basic trade skills, such as measuring, using hand and power tools, sketching, and health and safety precautions.



One subject he wishes he had taken is graphic design/tech drawing. “This would have improved my drawing skills and made it easier to do quick sketches on the job for working out issues or planning a part of a job.”

Reid’s goal is to one day work for himself as a contract boatbuilder/cabinetmaker “and possibly build my own boat”.

If you’re thinking about the Launch it, School to Work programme, Reid’s advice is to give it a go. “You’ve got nothing to lose, and you never know, you might end up finding something you love that you wouldn’t have considered doing at school.

“I have definitely found something I enjoy doing which makes it a lot easier to come to work and want to learn, and take the apprenticeship seriously.”

The Launch it, School to Work programme connects senior students interested in a career in the marine or composites industries with employers who are wishing to source employees.

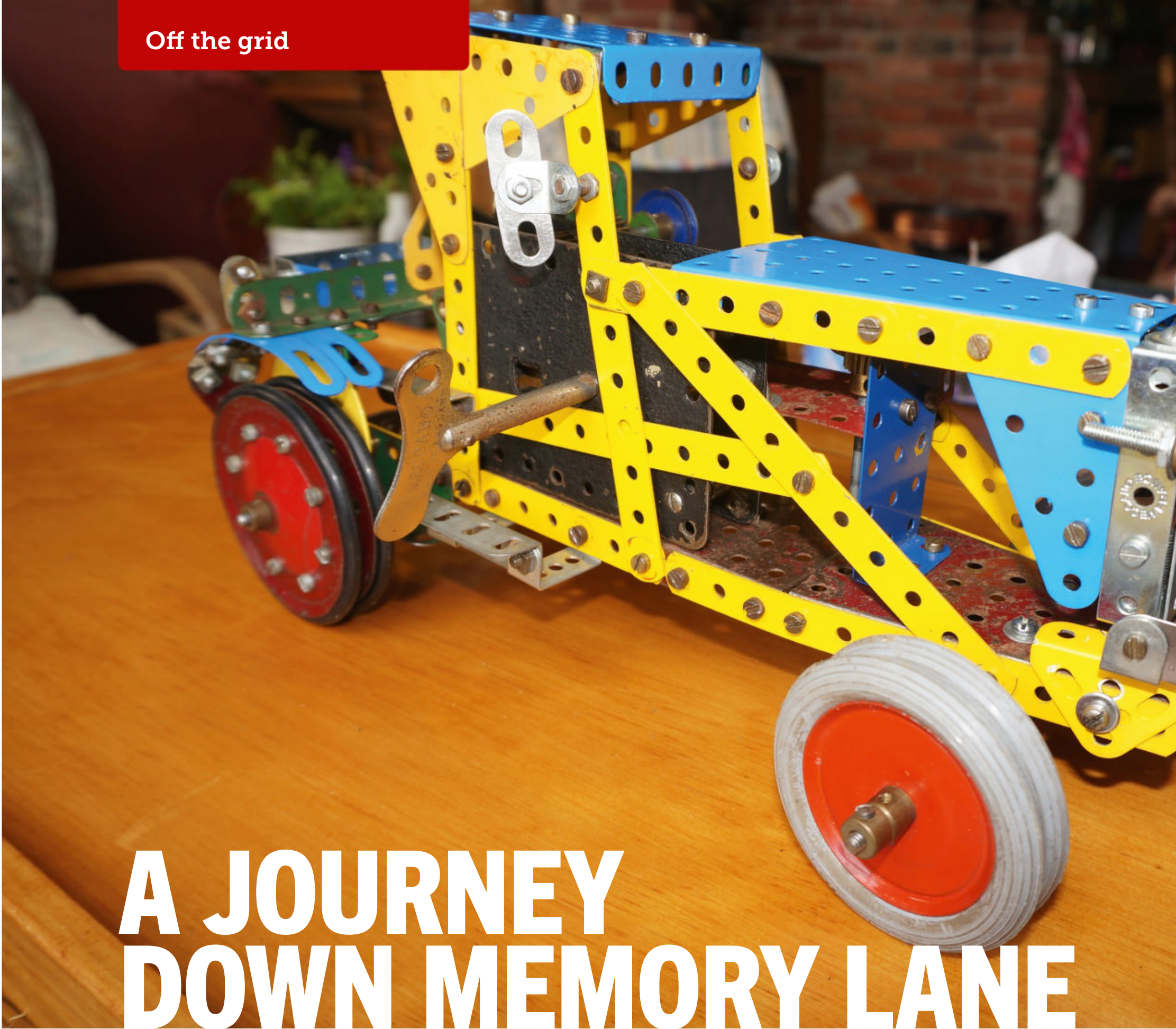
Students are employed on a part-time basis, usually one to two days per week at work, and spend three to four days at school, and complete NZQA approved unit standards. Work completed is credited towards NCEA Level 2 and 3, and is also accredited to a MAST industry qualification.

MAST Academy offers a diverse range of pathways for a career in the marine industry, including boatbuilding, marine systems, powerboat systems, sail making, and more.

For information on careers in the New Zealand marine and composites industry, visit www.mastacademy.com.

Story courtesy of Leaving School magazine.

oliverlee.co.nz/leavingschool 📄



A JOURNEY DOWN MEMORY LANE

MIGHT WE HAVE MECCANO TO THANK FOR BRITAIN'S VICTORY IN THE BATTLE OF BRITAIN?

By Murray Grimwood Photographs: Murray Grimwood

For the past few months I've been cobbling together a Meccano set. The excuse is that grandchildren will have rainy-day entertainment when they visit. The real reasons are probably nostalgia and straight-out indulgence; I've always loved this medium. A quick online search of Meccano exhibitions — check out the 4WD Bugatti! — will tell you that I'm not entirely alone.

Our first collection came home in the early '60s; Dad swapped his 1936 Rudge 500 for it — and, boy, were there debates about that over the years!

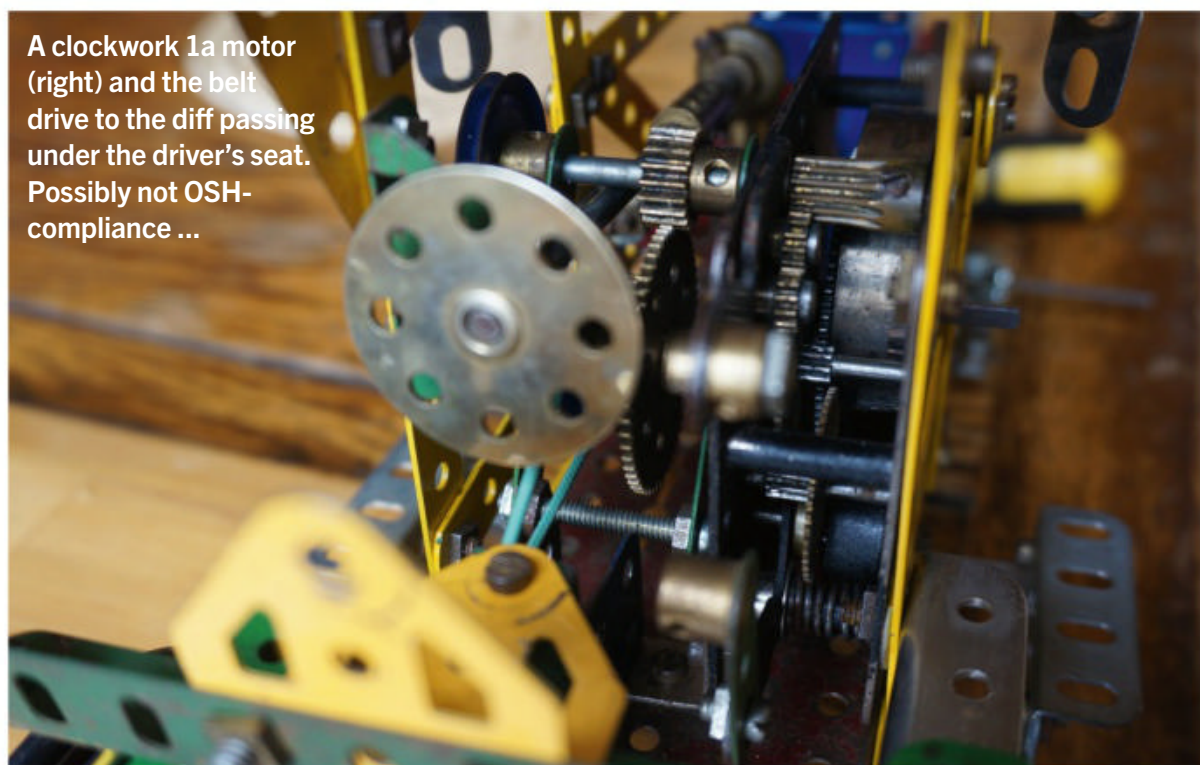
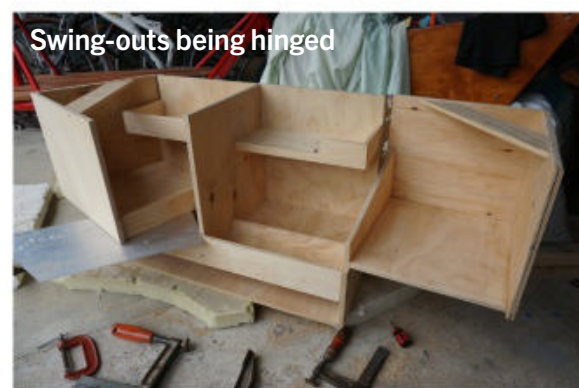
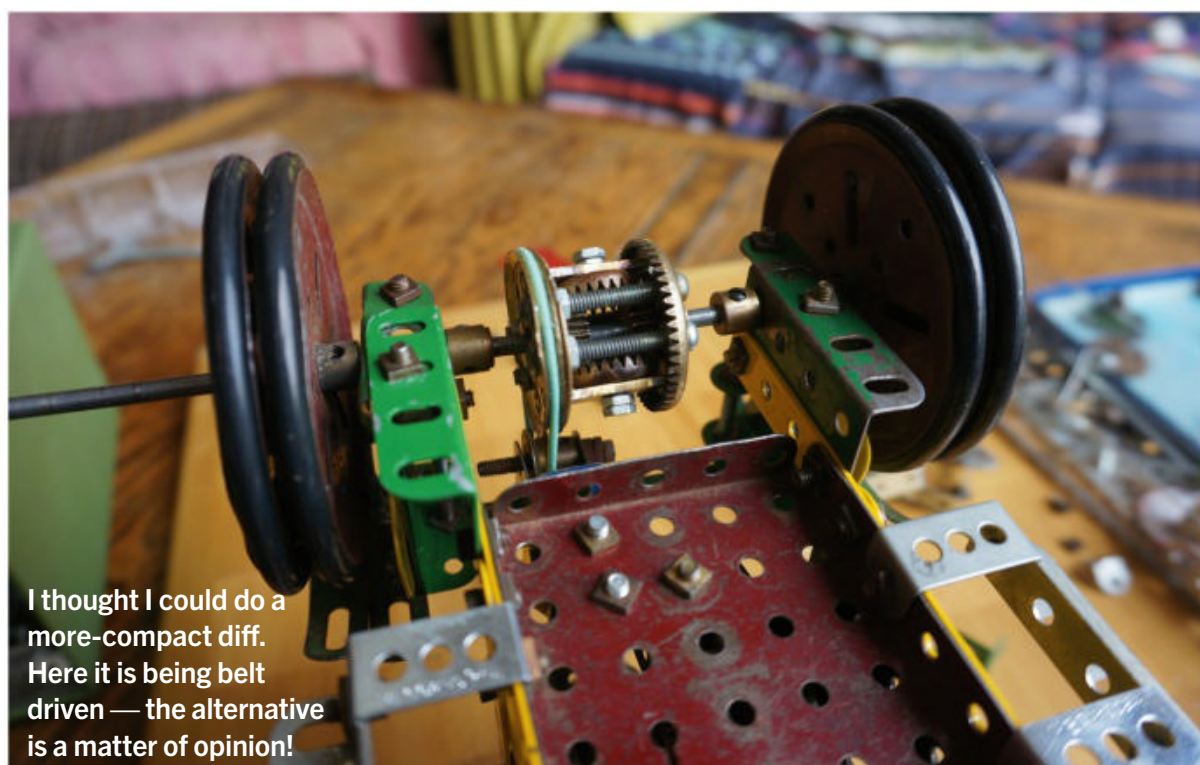
It would have been somewhere near a Number Six set: one big clockwork motor — a 1a, I've found out recently — one small one, and a drawerful of red-and-green-and-brass that promised unlimited possibilities, the way an unwritten page does. I can still hear the sound of us sifting through *that* drawer for exhibitions — the one we needed to do just *that* task.

My brother and I made pocket money by keeping three dozen hens and selling their eggs. The objects of our spending desires mostly resided

in Terry's Book and Toystore, to be drooled over on a Friday night. We sweated over how much to spend on what. Tintin books figured large, but shiny new Meccano pieces — offered for sale off the rack, individually — figured larger. Oh, how we sweated over what to buy next; and fought over who would get to use it first.

In the beginning

Frank Hornby came up with the concept in 1898, patented and advertised it in 1901, sold it from



“The decision to avoid purity made buying easier and the collection more interesting”

1902, and called it Meccano from 1908. Meccano went through a staged evolution over the years, and it's relatively easy to date parts. Initially they were of folded-edge sheet metal, but, by the time the Binns Road factory was built in 1914, the six sets — to be seven by 1922 and 11 eventually — comprised parts we still recognise: the

half-inch hole spacing; the rounded-end steel straps; the brass pulleys and gears.

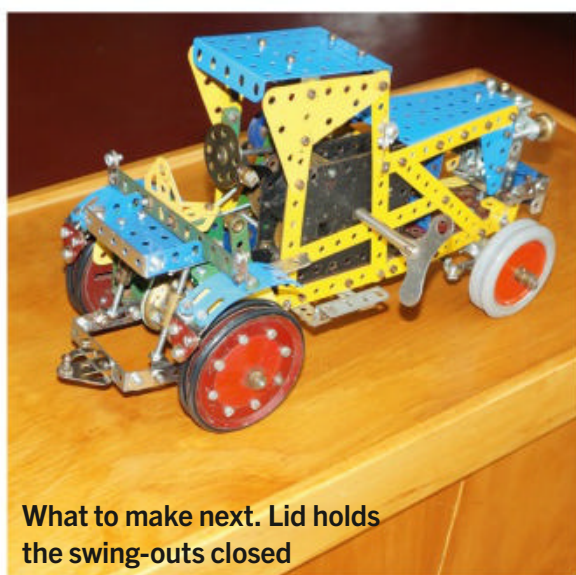
In 1926 it went red and green; from 1934 to 1945 it was gold/blue — cross-hatched on one side — but reverted to red/green post-war. A slight hue change identifies parts made from 1958 to '64. Then came black/yellow. The black changed to blue in 1970.

The number of designers, constructors, engineers, and others who have benefited from Hornby's

invention can never be known, but I'd not be surprised if someone proved a causal link between Meccano and, say, winning the Battle of Britain. Think of all the fitters who cut their teeth on the feel of square 5/32 Whitworth nuts in the jaws of a three-inch open-end spanner.

Meccano and me

I don't remember what triggered this late wish to rekindle an old acquaintance, but it coalesced into my



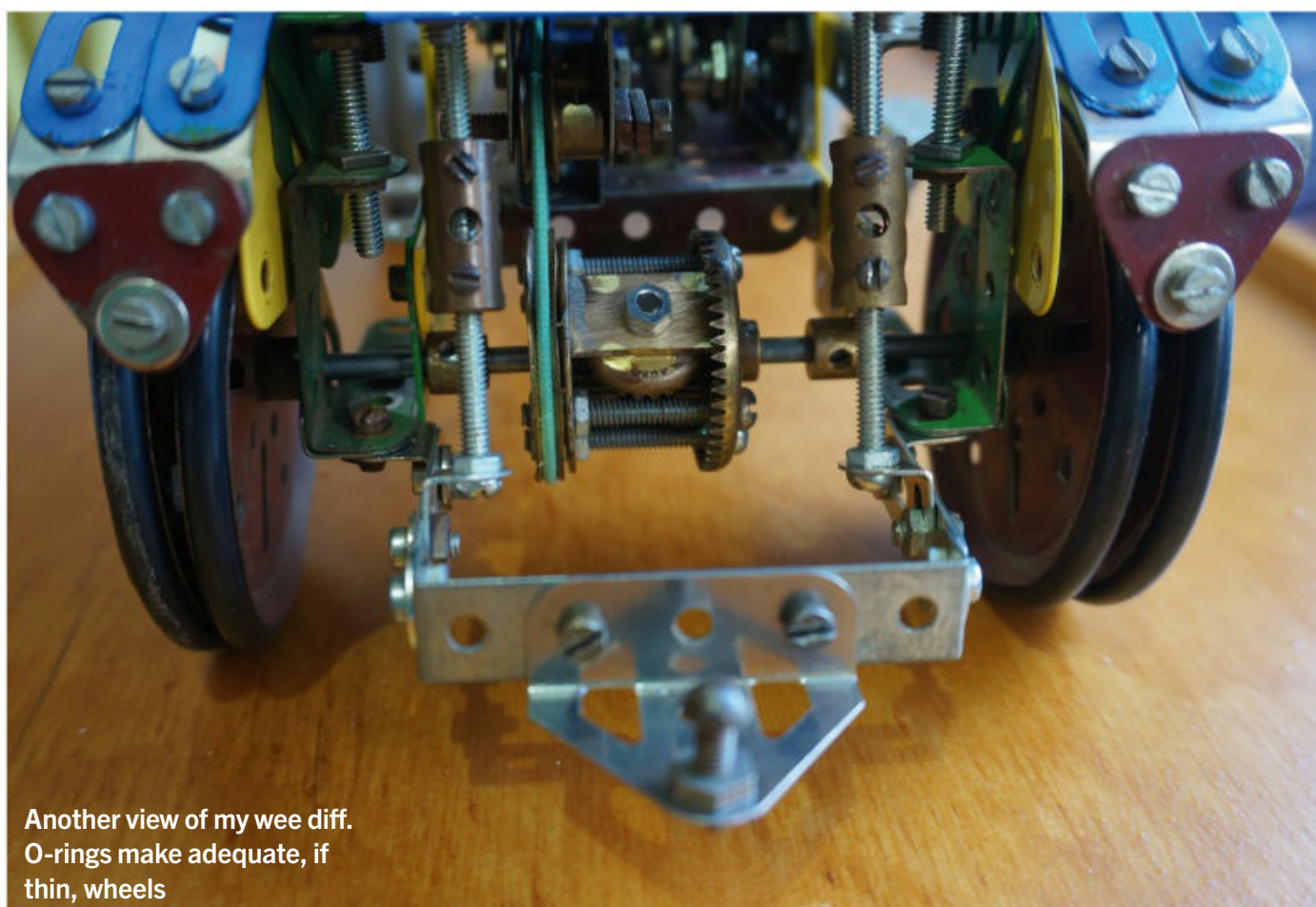
What to make next. Lid holds the swing-outs closed

wanting to assemble a useful set, albeit not an original or period one. I don't remember blue-and-black or blue-and-yellow parts, nor do I remember nickel ones — either vintage or modern — and I was way too early for plastic wheels. I had no idea that there were three big clockwork motors, no idea there were plastic/electric ones, and I couldn't even recall seeing an old-school boiler — of which I now have four; just in time to catch the steam revolution. But I have no objection to any of it; bring it all on!

The decision to avoid purity made buying easier, and the collection more interesting; my lot spans from the 1920s to recent French. Perusing Trade Me, I wondered occasionally whether some bidders were friends of the seller, or partners of those who resell small lots at high asking prices? Who knows? In the end I spent about \$650, plus a sheet of 12mm ply. I could think of worse ways to spend that — but I would say that, wouldn't I?

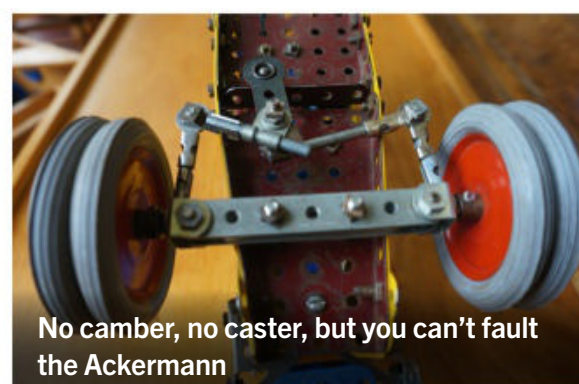
Inevitably, I'm light on some things, such as right-angle and two-hole girders and angle brackets — any readers with surplus of such, please get in touch — and over-endowed with others, such as axles and tapered plates. However, I've ended up with much, much more than that old drawerful that gave our younger selves so much fun — there were only about six pieces left; where did it all go?

Rubber O-rings, cheaply available off the shelf, turn pulleys into useful wheels — albeit thin ones to modern eyes. I found a handful of long 5/32 bolts and a box of countersunk-but-useful-enough short ones, at the local

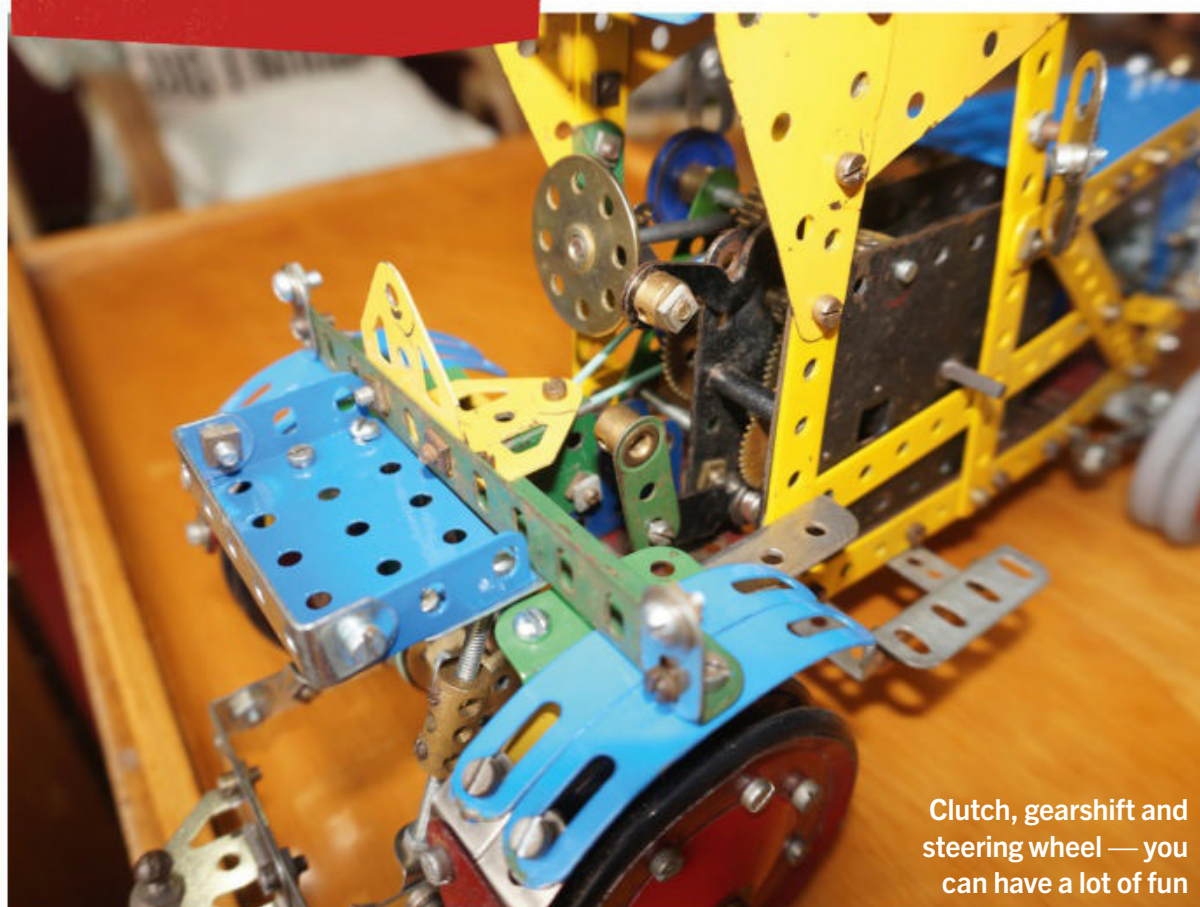


Another view of my wee diff. O-rings make adequate, if thin, wheels

“The need for a diff had me looking at the standard Meccano suggestion, and reckoning it could be done more compactly”



No camber, no caster, but you can't fault the Ackermann



Clutch, gearshift and steering wheel — you can have a lot of fun

machinery recyclers — of which I've often written. A bulk purchase of hex nuts added to the pottle of traditional fastenings; 5/32 Whit wasn't the first thread I learned to recognise — 1/4 Whit claims that privilege, via some

brass cheese-heads I can visually recall to this day — but it ran a close second. Using it has triggered forgotten techniques, albeit with bigger, clumsier fingers.

A wee diff

I built a loosening-up item that grew like topsy — see photos — just to get the hands (and fingers) back in. The need for a diff had me looking at the standard Meccano suggestion, and reckoning it could be done more compactly. I removed the bosses from a big pulley and a big contrate gear, spaced them apart with a couple of brass blocks, tried and failed to hold it all with solder alone, and ended up using a cage of bolts and locknuts.

Small straight gears run loose where those bosses were, grub-screwed to the half-shafts — one of which goes right across into the opposite gear, to assist alignment. Two small contrate

gears act as spiders; bevel gears all around would have been better, but I didn't have enough. The cage can be driven by a belt, rubber band (or hair-tie; don't tell her!) or, with a bit of extra locating, a toothed pinion. The difference (bad pun) that 60 years have made is that back then I wouldn't have dared to permanently cannibalise components.

Lateral thinking (of course)

The assemblage I cobbled together came partly in a three-tray set, partly in a very old box/tray set, but mostly loose. I needed to house it. Old-school Meccano boxes seemed to be a stack of pull-out trays, perhaps with a lift-out

top tray. My initial use of the stuff suggested that everything should be exposed to view and available within arm's reach, much like the keyboards and stops of a big pipe-organ — scrabbling around in a single drawer is sooooo yesterday.

Using those three already-built drawers as a starting-point gave me a footprint. Clearly I could reach either side of that, but just sliding a drawer sideways wasn't the answer; the vacated gap wouldn't be high enough to see all the way back, and there would be a slide mechanism in the way. How about swing-out trays? The only places that arcs would swing clear away

Amazing Meccano

When writing this article, I remembered that Dad had produced one of New Zealand's earliest tape recorders, and used Meccano gears — guaranteed buyable off the shelf, circa 1955 — in the control mechanism. I remembered a big contrate gear on a shaft, thought a photo would be applicable, went out to the shed where I have the remains of an Ellwood recorder — and the gear wasn't there. Flashback! My brother and I had nicked the gear off that shaft — because we needed it, of course. That would have been about 1967; perhaps I should put one back on? Better late than never.



Pull-out gear tray (left)



This beats scrabbling around in a single drawer, and there's space for more!



The early limited-production tape recorder — from which we stole a gear in 1967 ...

The right call?



The answer to whether the old man did the right thing in swapping the Rudge for our set all those years ago? I'd have learned from the Rudge — patience and Anglo-Saxon expletives probably — but I got a lifetime of design thinking from the Meccano. The design of this box can be directly traced to thought paths acquired when using that old set. When indulging myself at 67 years of age I'm not collecting Rudges, but I can build a Meccano model of one any time I get the urge — as every model maker knows, aesthetics always survive scaling. Then I can turn it into something else, and something else again. So, excuse me but I've got a Type 35 Bugatti to build, followed perhaps by a Santos-Dumont Demoiselle, and maybe one of those big cranes.

were the outside ends of the back wall. Nice and open, but the back wall would then need bracing — and that could only happen dead centre.



Open for business, bottom drawers determined footprint.

Result

So it evolved: those three drawers at the bottom, a fixed full-sized tray above that, trays swinging open either side on the next level, and a shallower tray high enough not to shadow stuff stored below. The last I sized to carry a pull-out cartridge box that had come with the bits and bobs, and I hung the very old tray underneath it, to carry gears.

I initially thought I'd need a latch to hold the swing-ins closed — until I realised the lid could do the job. Some Sikkens/turps/varnish brushed on for a sort-of period look, a few hooks on

which to hang things, and it was time to say “enough”.

One could have colour-matched the old drawers with the ply; one could have abandoned the old tray — which someone had chiselled completely through when creating gear recesses — but that's not my style. Those drawers are what they are, and that chisel mistake was made perhaps 90 years ago. Both are part of the patina, part of the backstory. I hope that one day the collection enchants a young visitor; that it entices them to be constructive — in both senses of the word. 📖



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BRAGGOT BEER — A MALT MEAD

THESE LONG SUMMER EVENINGS ARE PERFECT FOR SAVOURING THE COMPLEXITY OF A BRAGGOT FOR THE FIRST TIME — AND MAYBE LAY ONE DOWN TO ENJOY NEXT YEAR

By Bryan Livingston Photographs: Bailey Livingston

Over the summer holidays, I was watching the movie *Robin Hood* on TV. Russell Crowe stars as Robin Hood in this version, and as he and his men came upon the settlement near Sherwood Forest he was met by the local Friar Tuck. In this movie, Tuck kept bees as a hobby and, as a sideline business, he fermented the honey from the bees to make mead,

which he sold to the local workers. Now, what has this to do with a beer article, I hear you ask?

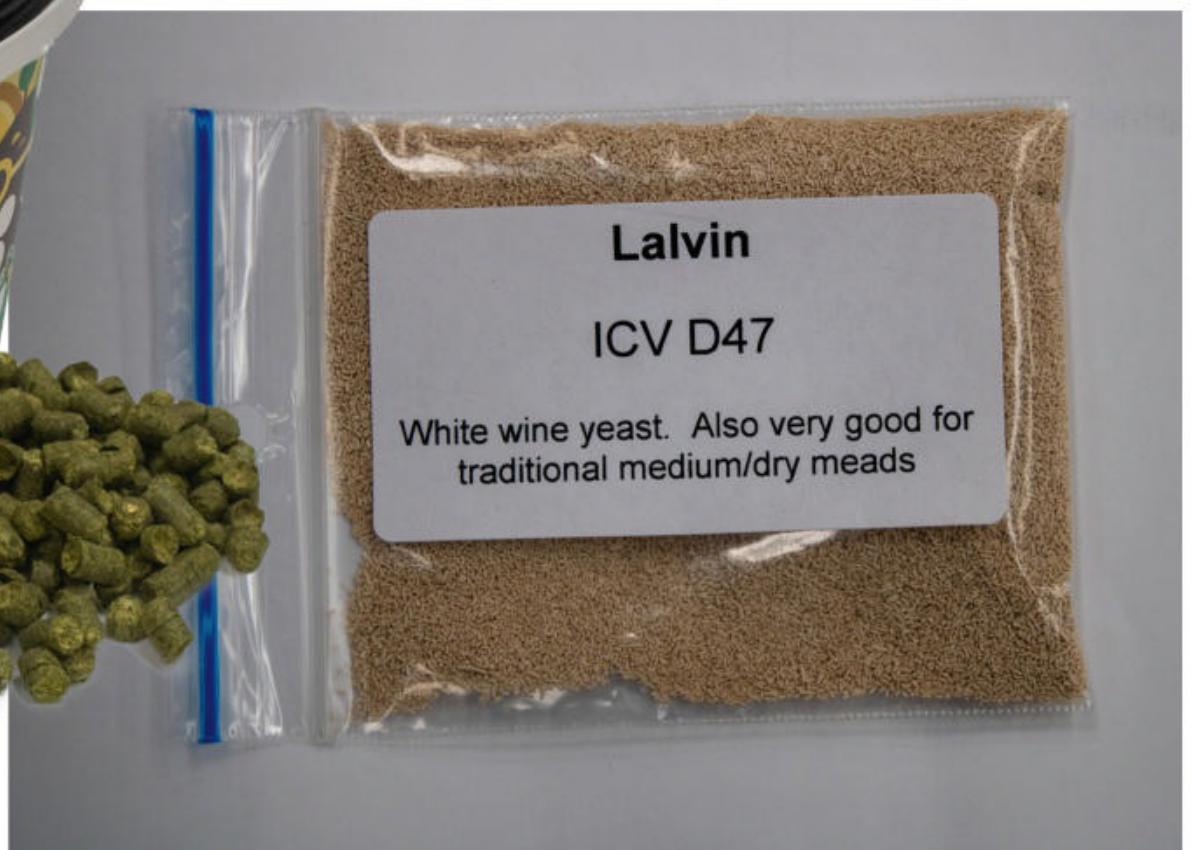
Mead has a colourful history that stems from mediaeval times, but we are interested in one small style within the mead recipes that has survived the passing of time and is a beer style still made today.

Braggot

A braggot is a malt mead; in olden days, it was also referred to as a bracket or brackett. A braggot was originally brewed by

fermenting honey and adding hops, but later it evolved to be made with honey and malt; some were made with or without hops added.

Before hops were used, braggots were made with various fruit, spices, and grains to add different flavours to the beverage. I guess it would be no different from us going to the pub today and having and have several different beers on tap! Alcohol in a mead ranges from 3.5 per cent ABV to 18 per cent ABV, and they can be made still, carbonated, or naturally sparkling; dry, semi-sweet, or sweet.



Braggots today

Mead has seen a resurgence with the growing trend of people keeping bees in their backyard. Over the summer, several kilograms of honey can be extracted from a hive, and that is a lot of honey to put on your toast. So, people have explored other ways to use their honey stocks and making mead has become a popular choice. Some meads are now sold commercially in New Zealand.

Beer brewers who also keep bees have started adding honey to their beers, and thus braggots are back. I even know of one commercial brewer who has brewed a spiced braggot and has sold it as a limited release.

Making a braggot

There are some tricks to making a braggot or malt mead. Obviously, you need to have a target alcohol content as this will determine the amount of honey and malt to add to your recipe. Other considerations include:

Honey Choice: There is a big difference in the selection of honey. A blossom or clover honey will be more delicate than a bush honey or manuka honey. I personally prefer the lighter honeys; they have a subtle honey aroma and delicate flavour that support the malt rather than overpowering the malt character.

Yeast: Traditionally, wine yeasts were used but today

Modern braggot recipe

'Just the Bees Knees'

Est ABV 7.5%

INGREDIENTS

MALT

- 4.6kg pale malt
- 750g Munich malt
- 400g light crystal
- 100g light chocolate malt
- 1kg honey
- zest of two lemons — added in last five minutes of boil

HOPS

- 10g Pacific Gem (60 min)
- 20g Cascade (20 min)
- 60g Citra hops (dry-hopped on day six for five days)

YEAST

- 2x Lalvin D47 or 2x Mangrove Jack's mead yeast

PROCESS

- Mash grains at 65° degrees for 1 hour.
- Sparge to a pre-boil volume of 28L.
- Boil for one hour with hop additions and lemon added at times stated in the recipe list.
- Cool to 18° and pitch yeast along with 2 teaspoons of yeast nutrient.
- Add another 2 teaspoons of nutrient on day six when adding your dry-hop addition.
- Make sure specific gravity is consistent and down to approx. 1.010 before bottling.
- Prime bottles with one level teaspoon of sugar, cap, and store to age.

For an extract version of this recipe, replace the 4.6kg of pale malt with two 1.7kg Blackrock Light cans of liquid malt extract.

commercial mead yeasts are available from your local home-brew shop. My personal favourite is Lalvin D47 but Mangrove Jack's mead yeast is also popular.

Yeast nutrients: Yeast loves eating simple sugars to make alcohol but

struggles

to convert complex sugars. Yeast nutrient is key when making meads. We add it at the start of fermentation but we also add a little more halfway through the fermenting process. At this point most of the simple sugars have been converted and the yeast count is very high.

Adding nutrients gives the yeast a 'boost' to speed up and convert the remaining complex sugars. If you don't do this, your mead can continue to ferment at a very slow rate and, if it is bottled before the sugars are fully converted, your bottles may explode!

Time

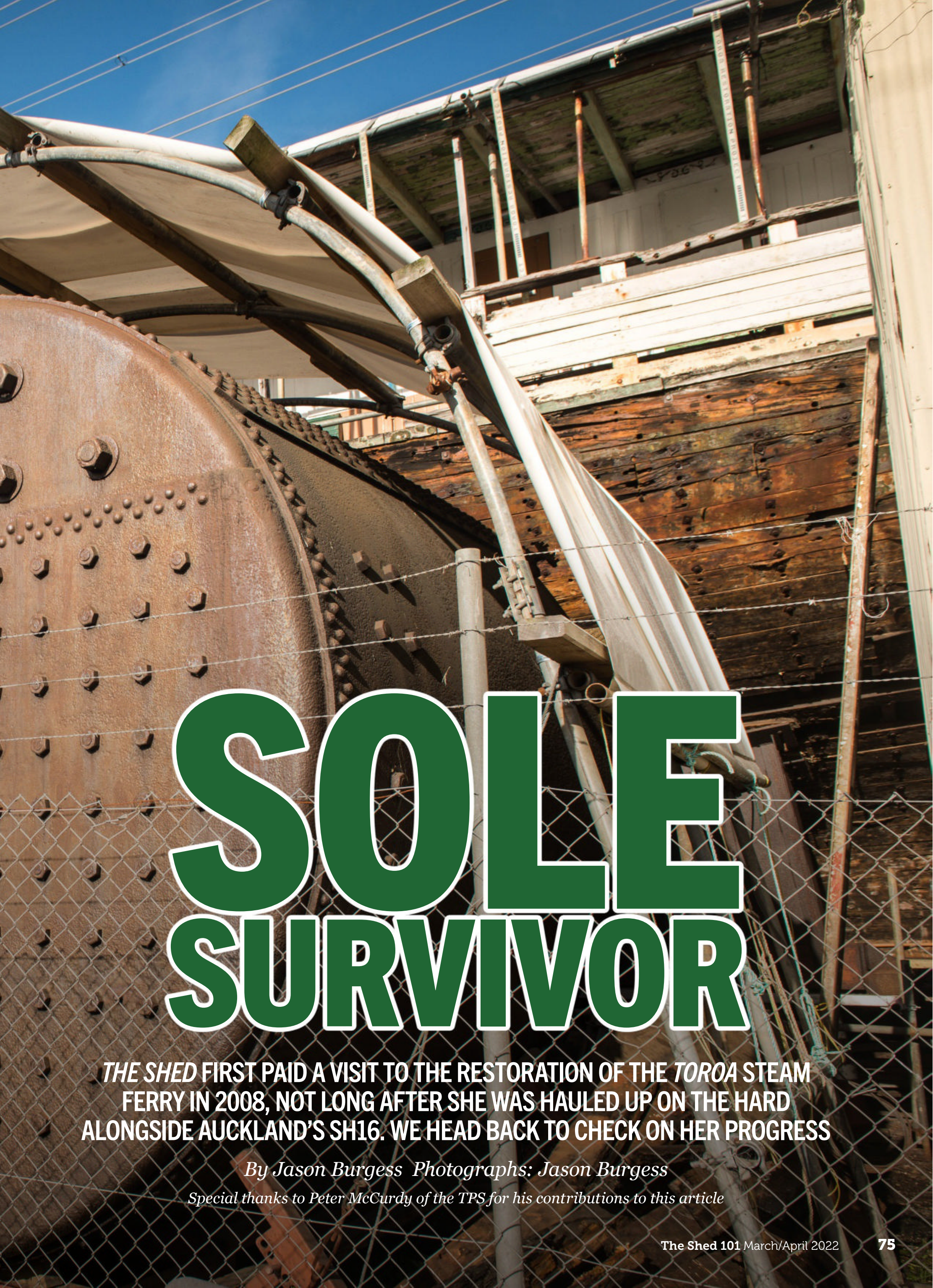
As a BJCP qualified judge, I've judged many competitions over the years and have tasted some great braggots. The ones that have scored highest and have won their class in the competitions have all been older than 12 months. Just like an aged wine, an aged braggot mellows with time, and flavours and alcohol become more balanced and smoother to drink.

I'm not saying you have to leave all your brew for 12 months, but if you do put some away and let it age you will be amazed with the result. By all means open a bottle after it's been in the bottle for a month or two, so you can taste the result of your hard work, but you will find the longer it ages the better it will be. 🍯





The last of Auckland's steam ferry fleet the *Toroa* and the original riveted Scotch marine boiler



SOLE SURVIVOR

THE SHED FIRST PAID A VISIT TO THE RESTORATION OF THE TOROA STEAM FERRY IN 2008, NOT LONG AFTER SHE WAS HAULED UP ON THE HARD ALONGSIDE AUCKLAND'S SH16. WE HEAD BACK TO CHECK ON HER PROGRESS

By Jason Burgess Photographs: Jason Burgess

Special thanks to Peter McCurdy of the TPS for his contributions to this article



With the bulk of her internal steel work near complete, the *Toroa* now awaits her new planking

Appearances can be deceiving and that certainly is the case for the *Toroa* ferry. While enormous progress has been made — including the renewal of the steel framework — none of this is visible to passing commuters who see it from the adjacent motorway. They only see the superstructure and timber work that has yet to be tackled.

Seaworthy? Not yet. But despite first impressions, her refurbishment to an operational and authentic state is well underway. “The perception is, ‘Oh, they are not doing anything’. But there are hundreds of thousands of dollars and

thousands of man hours that have gone into the hull, which is invisible from the outside,” says *Toroa* Preservation Society President, Robert Brown.

“It is believed to be the last remaining wooden, double-ended, two-decked, steam-powered passenger ferry, still with original machinery, in the world”

A very dedicated team

Decayed wood, rusted steel, and oxidised machinery have not dampened the spirits of the small but devoted crew of volunteers. The dedication — not only to the work at hand but to finding the funding to carry it out — is palpable.

The *Toroa* is no ordinary dame. She is believed to be the last remaining wooden, double-ended, two-decked, steam-powered passenger ferry, still with original machinery, in the world. And certainly the only kauri-hulled vessel of her kind.

Toroa is the sole steam survivor of



Peter McCurdy. “We’re carrying out the restoration in stages,” says Peter. “There is an overall plan for the whole project and a detailed plan as we work through each particular stage. You can’t think about the details of the whole job simultaneously, otherwise you can get overwhelmed. You have to have a long view. We started the renewal of the framing amidships because that was where the shape was simplest, with least bend in the steel ribs.”

To date, *Toroa* has been invested with 40 tonnes of new steel framing, all fabricated and installed: 200 square-metres of steel plate-and-angle transverse and longitudinal bulkheads

fastened with 10,000 rivets; a third of a kilometre of steel angle main-deck beams; and a kilometre of steel of peculiar, now-obsolete, bulb-angle cross-section, specially manufactured in the UK, to create replacement frames, or ribs.

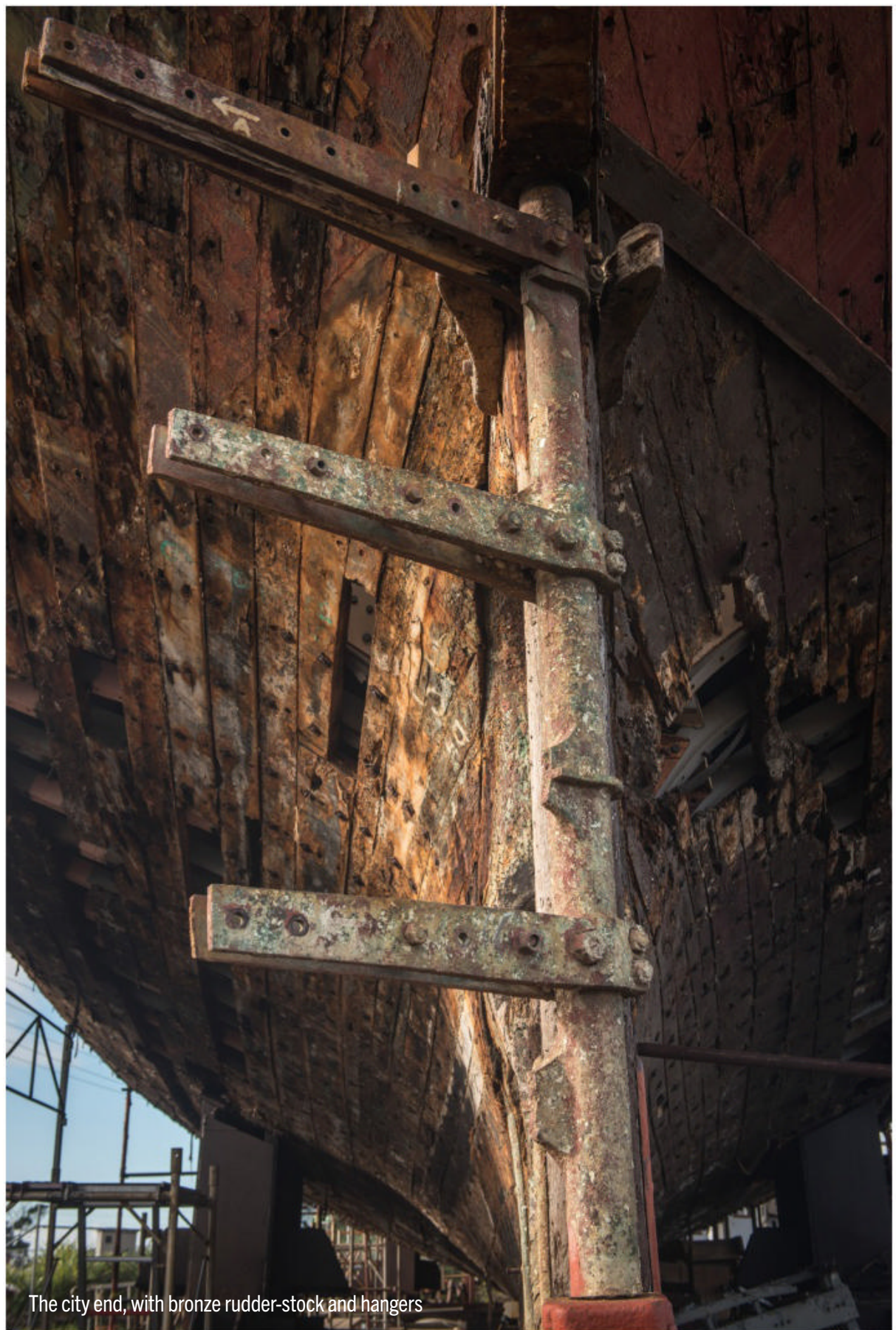
Life on the harbour

At her peak, *Toroa* carried upwards of 10,000 passengers per day, mostly between Devonport and Auckland — as many as 70 million in her working life. With that many passengers come plenty of memories and the crew here have heard their share, including blokes getting an impromptu dip in

a fleet of *Albatross*-type passenger ferries that were once a common sight on Auckland’s Waitematā Harbour. The rest are sadly long gone, some as landfill at Westhaven Marina. “We have very few large maritime artefacts left in New Zealand,” says Robert, “especially ones that were built here. They are being scrapped at a huge rate.”

A detailed conservation plan

The crew of volunteers are following a detailed conservation plan and as-built drawings that were two years in the making, prepared by society secretary and vessel conservation manager



The city end, with bronze rudder-stock and hangers

the briny while attempting long-jump boarding or disembarking when the ferry was underway.

She's been a star of the screen in *Shortland Street* and was once renamed *Daffodil* for a TV production called *Deepwater Haven*.

Of her crew, *Toroa* carried one stoker of note, who was so busy preaching politics to the engineer that he stopped shovelling coal. The steam pressure dropped and the boat got slower and slower. This earned him a bollocking from the skipper. The stoker, though, got the last laugh. It was his job to make the tea for the crew and instead of giving the skipper his usual two teaspoons of sugar, he served him washing soda — used to condition the boiler feed water — which, they say, has the same effect as Epsom salts. That stoker was Norman Kirk, doing a six-month stint on the *Toroa* in 1943 on his

way up the union and political ladder to becoming Prime Minister in 1972.

“You can't think about the details of the whole job simultaneously, otherwise you can get overwhelmed”

An eventful life

Toroa's 55-year service on the busy Waitematā was not all plain sailing. There were regular collisions with wharves, one involving an ocean liner, and sometimes with other vessels, including the 'Sea Devil' Felix von Luckner's nemesis, the cable ship *Iris*.

There is a story of a stoker who hung his wet clothes to dry over the chains

linking the wheelhouse telegraph with the engine room repeater telegraph. When the Captain telegraphed full astern to slow the vessel as she approached her berth the chains jammed, the engineer took no action, and the boat ploughed into the end of the berth.

One engineer had a practice of ignoring the telegraph when berthing at Devonport and would wait until he could see the first outlier fender pile over the engine room door before using the reversing engine to reverse the rotation of the engine and the propellers. This was a risky practice because sometimes the engine would stop, then refuse to start in the opposite direction. After some freight incidents, which the engineer refused to learn from and change his habits, the inevitable happened: in the absence of propeller braking, the ferry carried on





Toroa under the new Harbour Bridge, early 1960s (Hooker Bowden photograph, Stewart family collection)

and smashed into the end of the berth.

In utter disgust the skipper left the wheel and stomped down the gangway, along the wharf, and across the road to the Esplanade Hotel where he spent the rest of the day.

Oops

This ‘hanging-up’ of the engine without starting in the opposite direction had happened before. The reversing engine used steam pressure to shift the valve gear so that the engine, and therefore the permanently-coupled propellers at each end of the ferry (no clutch, no gearbox), would turn in the opposite

direction. The explanation for the problem was discovered by one of the society’s marine-engineer volunteers, the late Don Bradshaw. Don was born

*“That stoker was Norman Kirk, doing a six-month stint on the *Toroa* in 1943”*

on the Clyde in Scotland (where *Toroa*’s engine and boiler were manufactured in 1924) with steam oil in his veins.

When he dismantled the reversing engine to restore it he found that it had been wrongly assembled from new!

Ironically, *Toroa* incurred its most crippling damage when it sank during a fierce storm in 1998 while berthed alongside Birkenhead Wharf. She stayed submerged there for a month and that took its toll. Two salvage attempts, the second successful, and tidal currents and waves did much damage and removed much of the superstructure above the promenade (upper) deck, and the prolonged soaking in salt water over time vastly exacerbated the corrosion in the steel skeleton.

19th-century ship building

“When *Toroa* first came out of the water,” says Peter, “some of our early volunteers wanted to pull off the planking and get stuck into the steelwork straight away. The hull was floppy and fragile; it consisted of badly corroded steel framing held together by the wooden planking. The planking had to stay on as a basket to support and give shape to the new steel skeleton. It took a lot of dissuading them, but after rebuilding from the inside out, she is sound and rigid enough to be able to renew the planking.” And in a heritage project like this, intervention should not begin until everything has been properly assessed, measured, and documented.

Renewing the steel framing meant having to reinvent some obsolete Victorian ship-building practises. In the case of the new bulb-angle ribs, West

Auckland steelwright Andrew Macbeth devised a method using a cast-iron dog-slab (borrowed from the Navy dockyard at Devonport), with a high powered oxy-propane torch sufficing as a soaking furnace of yore.

Each rib futtock was shaped around a steel pattern bar (hot-bent

“In utter disgust the skipper left the wheel, and stomped down the gangway, along the wharf and across the road to the Esplanade Hotel where he spent the rest of the day”

to match a plywood pattern spilled from the planking) by heating the steel beyond red-hot with the torch.

As the torch swept along, an electric trailer winch slowly pulled on the far end, bending the bulb angle into a smooth curve against the pattern bar. Simultaneously, an assistant with an enormous homemade spanner bent the flange outward to the correct bevel to fit the planking at that rib’s station in the hull. The trailer winch and the long spanner replaced the traditional team of benders with their sledge-hammers, crowbars, and leather puttees.

Committed

“Andrew left his job to work on the *Toroa*,” says Peter. “At the time, we had substantial funding and could employ him full time. His skill and inventiveness were invaluable, particularly when it was found that the patterns made for three quarters of the boat did not match the last few frames forward on the port side. We



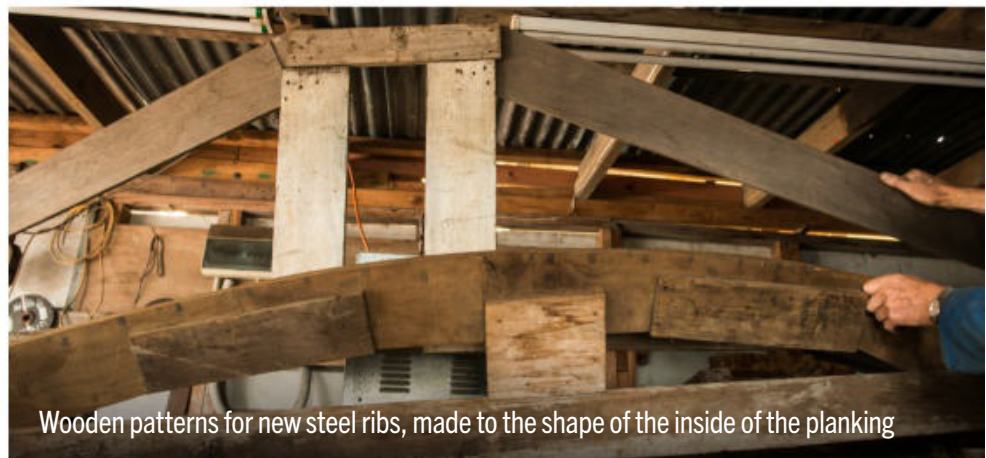
Passengers await the lowering of the gangway onto the promenade deck. Impatient wharf-jumpers line the rail below (Auckland Weekly News)



Installing deck-beam packers: Peter McCurdy, Gordon Whiteacre and Peter Henley. Deck beams, bulkheads and ribs have all been renewed



Planking removed for access to weld frame joints. The hull has 25 planks each side



Wooden patterns for new steel ribs, made to the shape of the inside of the planking

suspect that when the boat was built the steelwork contractor had a lump-sum contract, and so the framing is not perfectly accurate. In the ends of the hull Andrew had to take some ribs in and out four times to get them right because the curvature was tighter and reversed, and the bevel was increasing.

“Every time the curvature was changed, so too was the bevel of the flange, requiring further adjustment. Andrew was an absolute artist with this stuff. It looks like engineering, but there is a whole bunch of black magic, eye-work, and feel for how hot steel is going to behave.”

“In a heritage project like this, intervention should not begin until everything has been properly assessed, measured, and documented”

A good rhythm

When it came to restoring the bulkheads, the crew discovered corrosion in the riveted laps between plates. Rather than spend colossal

hours of labour to drill out rivets, check the laps, and then re-rivet them, it was much more economical to use new plate. Andrew devised a hot riveting process — using a gas forge he built and a pneumatic riveting gun — for fastening the replacement bulkheads. The bulkhead plates and angles were first bolted in place, then as each bolt was taken out a white-hot rivet from the forge was placed in the hole and backed up with a pneumatic ram, while a pneumatic hammer on the other side headed it over and pinned the steel together. As the rivet cooled, it shrank and created an exceptionally tight joint. As archaic and cumbersome

as it sounds, the crew got this process down to 55 seconds per rivet.

Timber

After the acceptance trials of the *Toroa* before it was pressed into service, the-then Devonport Steam Ferry Company's director Ewen Alison said that *Toroa's* tonnage was greater than that of any ferry steamer yet built at Auckland, and its bottom was sheathed in 'pure' copper. Nothing had been left undone in an effort to produce a first-class vessel. Clearly *Toroa* was seen as the pride of the fleet.

Toroa's fellow ferries, and most other large wooden vessels at the time, had their underwater planking sheathed in a layer of totara timber nailed over tarred felt and schenam, a mixture of lime and oil. It would have been an effective way of keeping 'the worm' — teredo and gribble — from penetrating the planking.

"Clearly Toroa was seen as the pride of the fleet"

Over time, as the seawater gradually seeped into the planking, a battery was created — copper sheathing (actually a copper-zinc compound, despite Alison's 'pure' description) plus galvanised steel fastenings and plain steel ribs in an electrolyte of sodium chloride dissolved in water. The resultant fizzing caused severe corrosion of the planking bolts and degradation of the wood around the bolts and behind the ribs. The planking bolts all had to be replaced in 1937 and the copper was replaced by zinc sheathing. This proved to be too soft and gradually peeled off and was replaced by — you guessed it — totara sheathing.

Deep timber damage

The extent of degradation of the kauri planking around the bolts and next to the steel ribs didn't really become apparent until the hull dried out. "We thought that when we took the hull planks off we could plane them down and reuse them for deck planking further up the boat. But this electrolytic damage goes so far into the wood that most of it won't be useful again."

The renewal of the steel main-deck beams required the removal of a couple of thousand bolts, and most had not been disturbed since 1925. On deck, timber plugs were extracted to access the bolt heads. Below, a few of the nuts could be undone, but many had to be cut off with an angle-grinder. Then a Kango hammer was employed to knock the bolts up through the deck planking, in an attempt to minimise damage to the timber. "There were showers of



Toroa's official number and register tonnage, engraved in the main-beam coaming



A new cheesehead deck-planking bolt



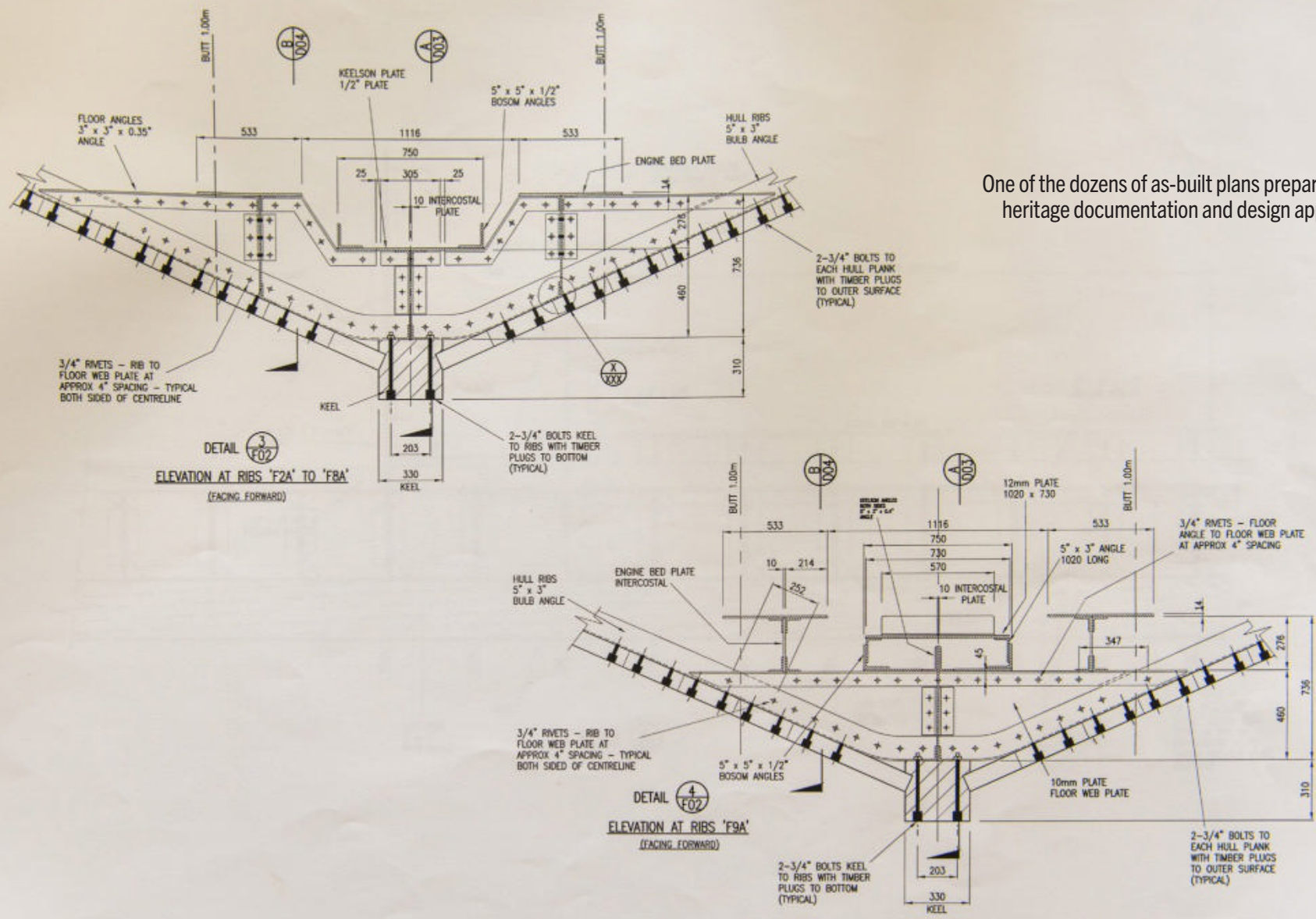
Toroa's steam gauges



A new deck-planking cheese-head bolt, with corroded originals



New bulb-angle steel ribs and riveted bulkheads fabricated and installed in the after machinery space

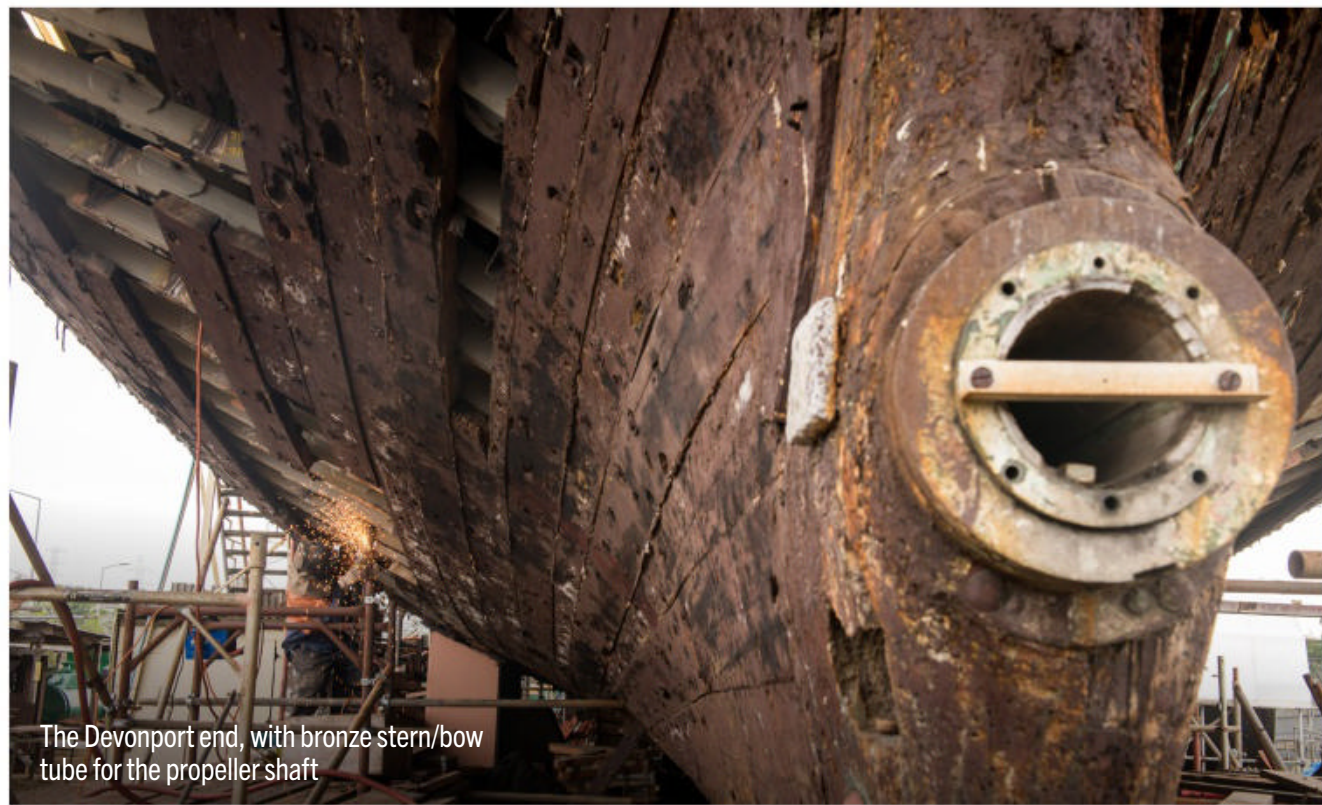


One of the dozens of as-built plans prepared for heritage documentation and design approval

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Steelwright Kim Henderson about to grind frame joints for V-butt welding



The Devonport end, with bronze stern/bow tube for the propeller shaft



Engine-room telegraph

rust everywhere!” says Robert. While they intend to restore as much of the existing deck planking as is feasible, there is then the matter of replacing the 8000-odd hull-planking bolts, and the planking they fasten.

Native timbers

Much of the curved timber in the bottom plates of the wheelhouses and the main-deck cabins was rotten and broken at the halved joints because the builders had used straight-grained wood. A supplier who had the rights to old kauri stumps was able to cut and supply crooks for the wheelhouses from the sweep of the roots where they meet the trunk. Still more of this compass timber is needed for the curved ends of the main-deck cabins.

Kauri to be used in the restoration is available only when designated for cultural purposes. None of it is from

living trees — much is from trees felled in the old logging days and unable to be retrieved, trees toppled by landslides, and standing trees killed by lightning. The advent of portable mills and helicopters has made the use of timber from these dead trees possible.

“Some of the timber already collected came from a farmer in the Coromandel who lost a grove of trees in a landslide 30 years ago”

Impressive milling set up

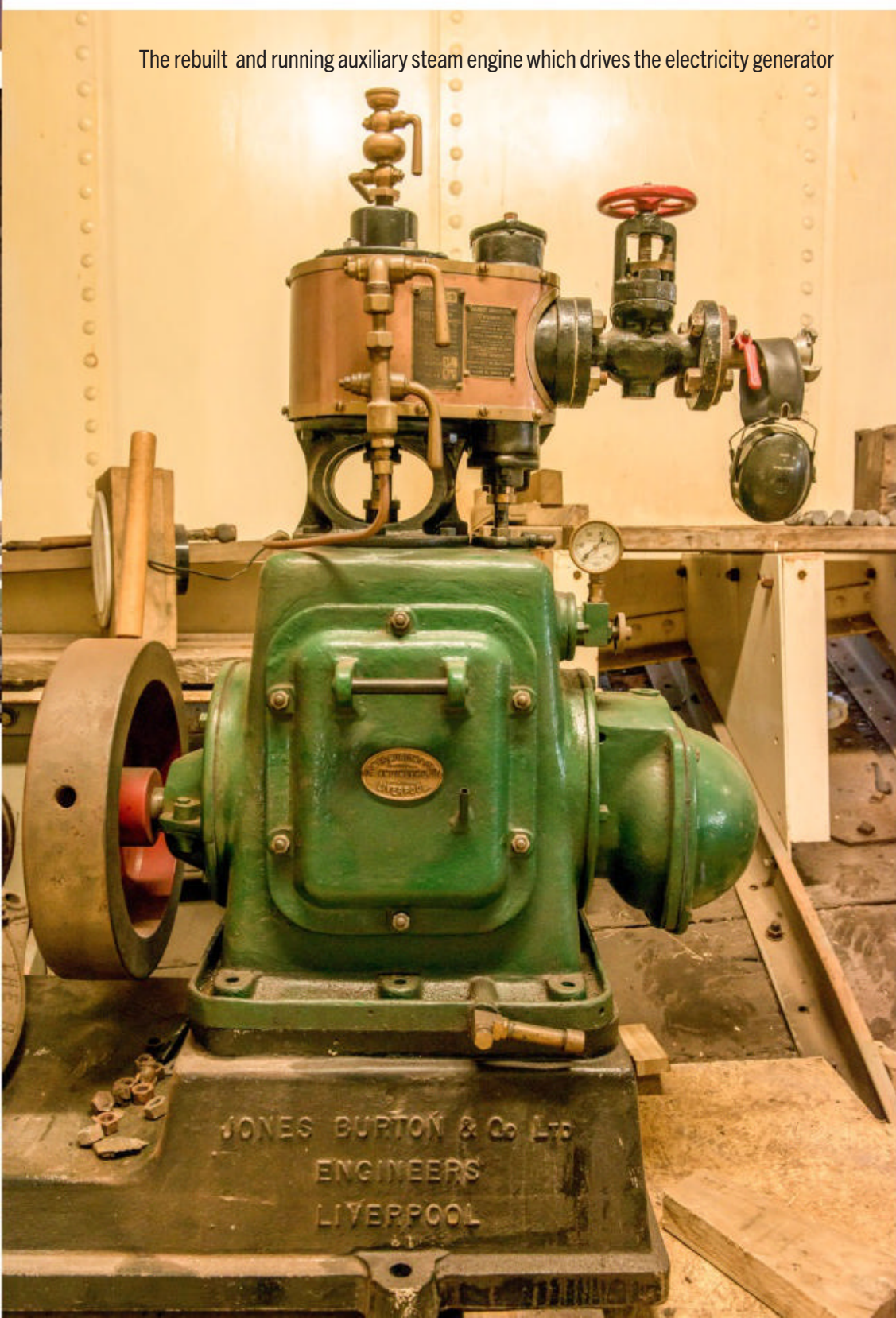
Much of the new timber will come from other, mostly renewable, sources: Scottish or Siberian larch, Alaskan

cedar, and local macrocarpa and Oregon when available in large and long clear baulks.

Some of the timber already collected came from a farmer in the Coromandel who lost a grove of trees in a landslide 30 years ago and has had the timber sitting in his woolshed ever since. This is stored in a shipping container, on a trolley designed and built on site, that ingeniously employs three trailer axles, using the hubs as wheels. The trolley runs out on a Brunel railway system with longitudinal sleepers set on a slight incline and controlled by a winch to give sideways access for a forklift to pick out any baulk for resawing into planking.

As the cost of commercial re-sawing timber is prohibitive, a bandsaw mill has been purchased and this runs on its own 12-metre railway. ►

The rebuilt and running auxiliary steam engine which drives the electricity generator



Andrew Macbeth-built three-wheel bender, used to curve new beams to the crown of the deck



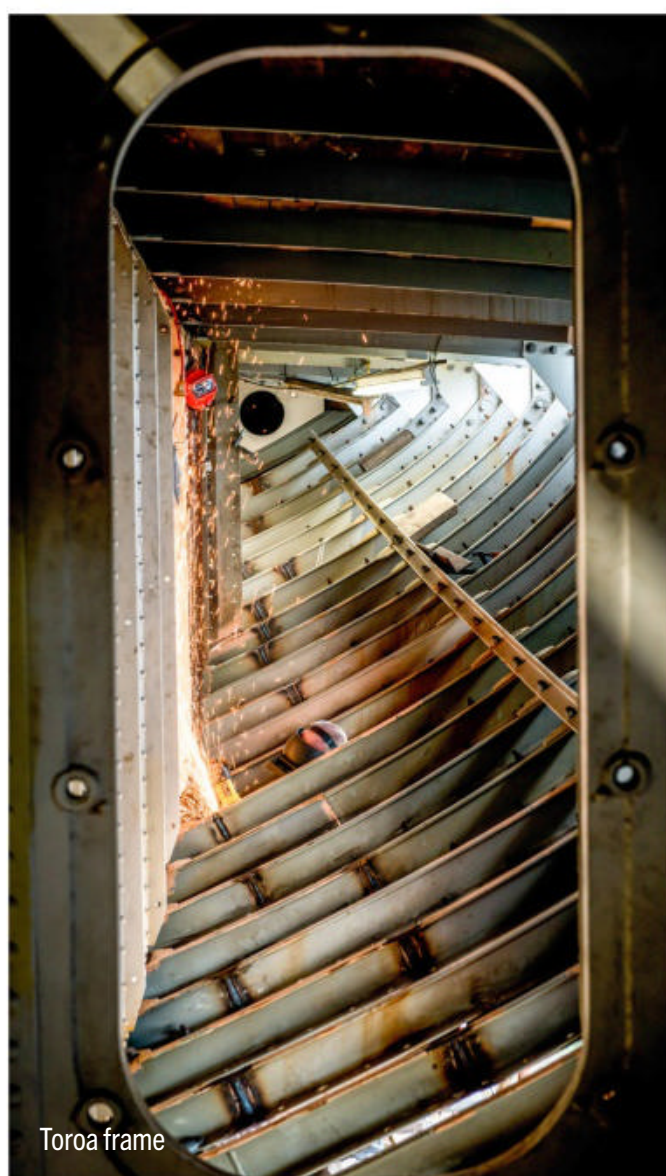
Grinding underway to prepare rib V-butt joints for welding



The engine room — water-tight door from HMNZS Wellington at left, thrust bearings stored on right



Robert Brown demonstrates the use of the bevel-bending spanner



Toroa frame



A corroded rib in the after counter, about to be replaced. Most of the original ribs were as bad as this

Funding the restoration

“When you think of the overall cost of restoring the *Toroa*,” says Robert, “it will be nothing compared to what people spend on superyachts. This is not a complicated design — it is not a vessel built from exotic fibres and resins and full of complex electronic, electric and hydraulic systems, and luxury fittings and accommodations.” The rate of progress of the restoration is dependent on how fast the funding can be generated. At current estimates, \$5 million is needed to complete the

*“At current estimates,
\$5 million is needed
to complete the
restoration”*

restoration — an insignificant amount in comparison to America’s Cup expenditure of fleeting benefit.

“The volunteers might get a lot of satisfaction working on the *Toroa*, but this is everybody’s boat; it’s Auckland’s boat, the North Island’s *Earnslaw*.” The race is now on to have her

completed and operating in steam on the Waitematā by 2025, in time for her centenary celebrations.

The *Toroa* Preservation Society welcomes new members and enquiries from volunteers. They are particularly seeking folk with trades or steam background, and other practical skills, including social media. Financial support for the restoration is also very welcome.

For more on the Auckland steam ferries and the restoration of the *Toroa*, go to www.steamferrytoroa.com. 📄

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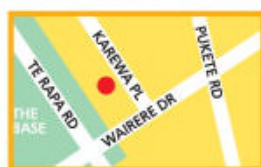
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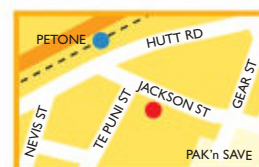
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Moas, Guzzis, and Guinness pies

**LIFE IS MADE UP OF MOMENTS —
ENJOY THE MOMENT**

By Mark Seek — www.seekandthrive.com

The winding loop road from Nelson through the Moutere Valley to Motueka and back through Mapua is a weekend ritual for many leather-clad motorcyclists. This road can be an exhilarating experience, to say the least. The sedate rural charms include hop farms, the oldest pub in New Zealand, and majestic views that belong on biscuit tin lids.

My wife and I resided there for several years, heading up community youth work/chaplaincy. Living and working in small-town New Zealand offers you a unique perspective. My wife often comments that it was one of her happiest times. Landowners and farmhands are some of the hardest-working folk you will ever come across, often time poor from their respective duties. Employing a person like myself to provide pastoral care and generally 'be around' was something they knew would be an asset to the community.



Apart from the odd misunderstanding, most of my work went unheeded and appreciated.

Good times

My old Guzzi got used a fair bit on Sunday afternoons, to destinations with names like Orinoco, Woodstock, and Dovedale; historic settlements with old wooden churches perched on hillsides; the smell of berry fields and hop farms on a summer evening — the reward for owning and riding an old classic bike.

We rented a farmhouse on a winery at the time. It was all too common to see the driveway littered with oily old Triumphs, Nortons, Harleys, and my best mate Laurie's Victory Hammer. We enjoyed my wife's home baking or, in the winter months, a ride over to Mapua to order hot Guinness pies from the Naked Bun bakery.

Now, this is where things get a bit weird in tranquil village life. On a quiet Saturday morning, I received a call from the wife, who had taken a stroll down to the main road to collect the eggs from the neighbours.

Her words were, "I've just seen a moa!"

"Oh yeah — a moa, you say?" I replied sheepishly.

"Yes, yes!"

She was insistent, and kept repeating, "A moa, a moa! You have to come down and catch it!"

"You want me to catch a moa?"





My wife and the Guzzi

I responded.

“Yes, come as quick as you can. I’m afraid a biker will come around the corner and crash into it,” she exclaimed.

You see, the large bird had apparently placed its feathered self in the middle of the notorious sweeping blind corner entering the village.

Moas are not extinct!

I tried communicating to my wife that moas are actually extinct, but her voice changed. She stated that if I didn’t take her seriously there were going to be dire consequences — not just for the unsuspecting biker and the ‘moa’, but also for me; I was going to cop it! With an idea of what that would look like — to be honest, I wasn’t keen on sleeping in the shed with a sleeping bag and a cat for company — I put on my boots and jumped on the Guzzi.

With a turn of the key, it groaned away. The carbs were frozen. After a bit of flame under the carbs with a lighter, she roared into life — rather, spluttered and farted!

“C’mon old girl, we’ve gotta see what all the commotion is about,” I thought to myself.

Tearing down the long shingle driveway, the pipes crackling and roaring under my command, we headed for the village up Sunrise Valley Road.

Chatting to a big bird

My eyes, all teared up from the morning’s frost, couldn’t believe what they were witnessing. My wife — a touch over five feet tall — was talking to this huge, angry looking bird. Holy s***! This bird would easily have been seven feet tall, with razor-sharp



An old hop kiln on the outskirts of Upper Moutere

claws and a mean-looking beak. I wasn’t going anywhere near it, and neither was the crowd of locals hiding safely behind the wooden fence. Convincing myself she had this under control, I, too, manoeuvred behind the fence and proceeded to offer up some encouraging words to the ‘moa wrangler’.

After what felt like an eternity — even longer in my wife’s shoes — the bird realised it had met its match, and decided listening to this little lady was its only option. It promptly wobbled through the gateway to safer ground. With this result, the crowd of onlookers erupted in applause and laughter, patting my wife on the back. Without her, that bird would have been toast!

The moa (?) was saved

With the excitement now over, the arrival of the owner confirmed the bird was in fact, an ostrich. Apparently, unbeknown to us, he had recently moved to the district with his small menagerie of exotic animals. His beloved bird had survived the day, and my wife was my hero. We headed home, two up on the Guzzi with another one of life’s adventurous

“If I learnt something that day, it is that, when life appears tranquil and calm, it may just turn to custard without any warning ... don’t take anything for granted”

stories in the back pocket. If you are ever riding through the Moutere, keep an eye out for moas!

If I learnt something that day, it is that, when life appears tranquil and calm, it may just turn to custard without any warning. Be aware that somewhere around one of life’s blind corners, there could be something very large and intimidating waiting for you to slam into it.

The word ‘resilience’ gets a fair bit of airplay at present. However, simply put, it requires us to have the ability to recover from unplanned events in life — something that we can all resonate with in these recent uncertain and challenging times. My suggestion is: resilience before adversity. Take life one day at a time, and don’t take anything for granted — your family, your job, or your health. Enjoy camaraderie, get that old surfboard or surf caster out, and eat more Guinness pies — you’ll be glad you did. 🍷

Replacing a hot water cylinder



Installed HWC



THE DEBATABLE JOYS OF PROGRESS!

HOW A FLOOD IN
HAVELOCK NORTH
RUINED MY HOT
WATER CYLINDER IN
CHRISTCHURCH

*By Ritchie Wilson
Photographs:
Ritchie Wilson*

We all know much more about epidemic diseases than we did a couple of years ago. We know that a disease-causing organism is called a pathogen. We are also more familiar than we were with the ways a pathogen can jump from one victim to another. The agent of transfer — fleas in the Black Death, used needles in HIV/

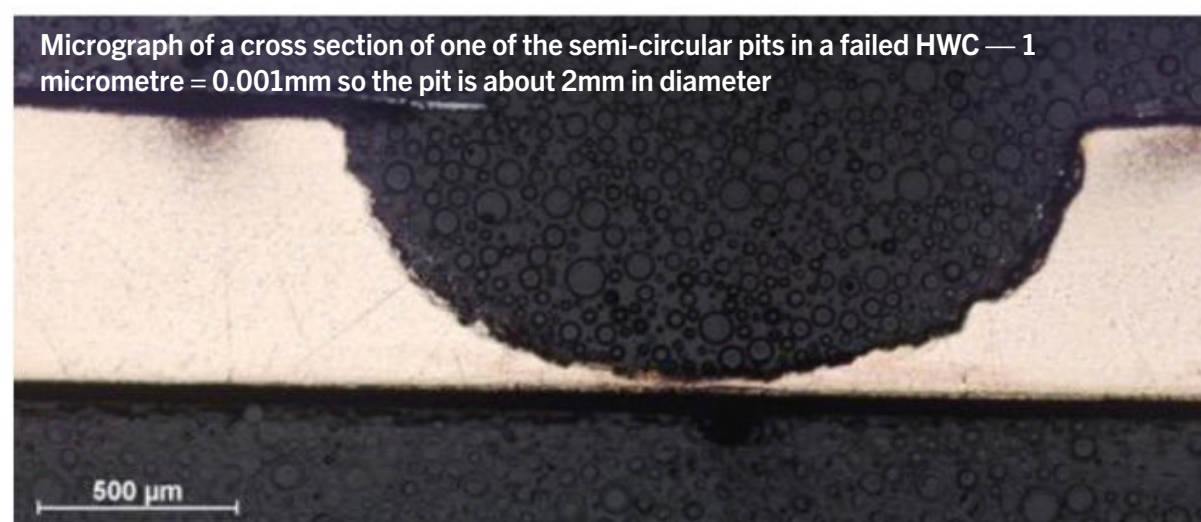
AIDS, mosquitos in malaria — is called the vector.

Drinking water has, over the centuries, been an excellent vector. In the early days of European settlement in New Zealand, if you weren't drowned crossing a river in flood — known as 'the New Zealand way of death' — you would probably die from

typhoid in the embryonic towns, due to the very common contamination of water supplies by sewage.

In 1993 more than 100 citizens of Milwaukee, Wisconsin — previously most famous for its beer — died in an epidemic of water-borne disease.

The solution to the contaminated water problem is either to stop the pathogen getting into the water or to kill it if it does, by adding chlorine to the water or boiling the water. Both methods have problems. Boiling is time-consuming and can be dangerous; it has been suggested in Britain that the danger to the elderly and infirm from the boiling water is greater than the danger posed by water-borne pathogens. Chlorine has an unpleasant smell, especially at higher concentrations, and, it turns



out, can cause pitting in copper hot water cylinders (HWCs) under certain conditions, leading to unfixable leaks in the cylinders.

A gastroenteritis outbreak in Hawke’s Bay

In August 2016 a serious outbreak of gastroenteritis occurred in Havelock

“Chlorine has an unpleasant smell, especially at higher concentrations, and, it turns out, can cause pitting in copper hot water cylinders”

North. It affected more than 5000 people — about a third of the town’s inhabitants — with 45 hospitalised. Those are the indisputable facts. It is probable that four people died as a result, and that the pathogen was the bacteria campylobacter, from sheep. The accepted theory is that floodwater carried sheep faeces to a below-ground pump-head that wasn’t sufficiently sealed to prevent the contaminated floodwater entering the town’s drinking water supply.

However, like a medical game of Cluedo, there are other possibilities: protozoa from private, unrecorded, possibly abandoned, bores into the shallow aquifer; or amoeba from deep earthworks breaching the aquifer’s confining layer are just two. The well head had come under suspicion

18 years before after a dysentery outbreak and it was officially ruled that the Hastings District Council had essentially ignored the problem.

The fallout was swift and wide-ranging. The mayor and the chief executive of the district council issued a public apology. In September 2016 an enquiry into the outbreak was instigated by central government. In December Hawke’s Bay Regional Council undertook criminal proceedings against Hastings District Council — a very expensive failure.

A change is needed

The government enquiry concluded that sources of artesian water in many parts of the country were dangerously susceptible to contamination as a result of pathogens in floodwater entering drinking water supplies by such means as inadequately protected below-ground well heads. Some parts of New Zealand’s drinking water supply system were unflatteringly compared to those of developing nations.

Local bodies nationwide were required to ensure that the drinking water they supplied was not liable to be mixed with floodwater and, if it was, they were required to routinely add chlorine to the water. Many of the well heads that supply water to Christchurch from the extensive aquifers under the city turned out to be below ground and therefore vulnerable to being inundated with floodwater. Chlorination of Christchurch’s water inevitably followed. ►





Plumber Andy inspecting the HWC



Base boxing

“The water had turned the flooring into the classic ‘damp Weetbix’ — swollen and weak”

The longer term consequence was that central government decided to take the responsibility for drinking water, storm water, and waste water — known as ‘three waters’ — away from local bodies such as the Hastings

District Council and the Christchurch City Council (CCC) and give it to new, larger agencies.

So, floodwater caused the Havelock North gastroenteritis outbreak, which led directly to the chlorination

of Christchurch’s water and, very probably, to the failure of my copper hot-water cylinder.

There’s something in the water

Some surprises are completely unwelcome: a stab of excruciating pain as you bite down on a crust, sunburn, or, as recently happened at Casa Wilson, the vinyl floor covering in the bathroom lifting in an irregular pattern.

Obviously, the particle-board flooring was swelling because it was absorbing water. But from where? The



Concrete base with extra height to keep it above minor floods



Drilling bolt holes in pad

prime suspect was a skylight directly above the damaged area, which had leaked in the past. But surely the vinyl would have stopped water on the surface from getting to the particle board. The swelling seemed to extend to an alcove housing the HWC. The shelves in front of the cylinder were cleared and removed and, sure enough, there, in front of the cylinder, was a small pool of water. The possibilities were a leak in one of the junctions of the pipework supplying the cylinder — easily fixed — or a leak in the cylinder itself.

It must be the cylinder

The thing was 22 years old and there had been reports in the local paper of numerous failures of copper HWCs because of the relatively recent addition of chlorine to the city's water as a result of the government's new water-safety regulations. The next questions were: how long had the water been leaking, and how much damage had been done to the particle-board flooring and the wooden framing under the cylinder? A visit under the house was needed (sigh).

There is actually much more space under the building than is usual, because the floor level was required to be above the 50-year flood level of the nearby Heathcote River, so the bearers, resting on the driven wooden piles, are almost a metre above the ground. The extensive water staining on the underside of the particle board indicated that the leak had been going on for some time — perhaps several months. There were signs of the black mould that develops on building timber in consistently damp conditions, which is a known health risk.

A hole bored through the particle board near the cylinder showed that the water had turned the flooring into the classic 'damp Weetbix' — swollen and weak. The floor would have to be replaced, along with the HWC. The bearers and joists, which provide the underpinnings of the floor, were of CCA treated timber and impervious to rot, so were not likely to be affected by the water leak. ►

A visit to my broker



Our hot-water cylinder (HWC) was made of copper and so had some value as scrap. It has been reported that the price of copper has increased by about a quarter in each of the past two years, reflecting the increased world demand for the metal. For instance, an electric vehicle (EV) contains about four times as much copper as the equivalent internal combustion engine car and, as the proportion of EVs in our car fleet increases, more and more copper will be required. The copper cylinder had to have its pipe junctions and electrical connections removed and to be extracted from the encasing foam insulation and the galvanised sheet steel shell. This is a messy process, generating a large volume of waste, and my broker recommended that I bring the whole cylinder into his yard as he was well set up to do the dismantling. I was curious about the number of scrap cylinders he was buying in an average week.

“Too many to count,” was the reply.

The HWC, stripped of its insulation, is crushed in a special machine and folded into a compact parcel. Pallet-loads of the folded copper cylinders are sold by auction to the highest bidder. Some Christchurch businesses use large amounts of copper and buy scrap from local dealers.

My broker pays in cash — you have to show identification first — and has a set rate for HWCs depending on their size. I had done some research about the prices a few local firms pay for cylinders and, while I can’t say that my broker pays the most — I got \$127 — I do know that he pays considerably more than some others. I also don’t know how much better I would have done had I gone to the trouble of stripping the insulation myself.

Getting paid for the ruined cylinder did salve the wound of our HWC failing, but only very slightly.



Stripped cylinder in press



Cylinder being squashed flat



Cylinders compressed into compact scrap-copper parcels

A big job

Replacing the bathroom floor was going to be a major undertaking because it would involve removing not only the shower cubicle but also a cabinet in the adjacent kitchen. Even if everything went smoothly, the bathroom would be unusable for a week or three and, with four adults and a two-year-old child living in the house, that was too long.

The younger adults and their child, my daughter and her family, were scheduled to leave when their house was completed in a couple of months, so it was decided to complete the repair in two stages. Stage one would be immediate, and would be the replacement of the leaking HWC; stage two would be the replacement of the floor, shower, and cabinet after my daughter’s family had departed.

Experienced readers will spot an expensive complication. The newly installed hot water cylinder would need to be disconnected, drained,

removed, and stored until the floor was replaced, and then reinstalled and reconnected — a potentially expensive and difficult process.

The professionals were consulted. One day the plumber visited, the next the insurance assessor arrived. They were strikingly similar men: cheery, chatty, but with other appointments to get to. They both adopted an identical

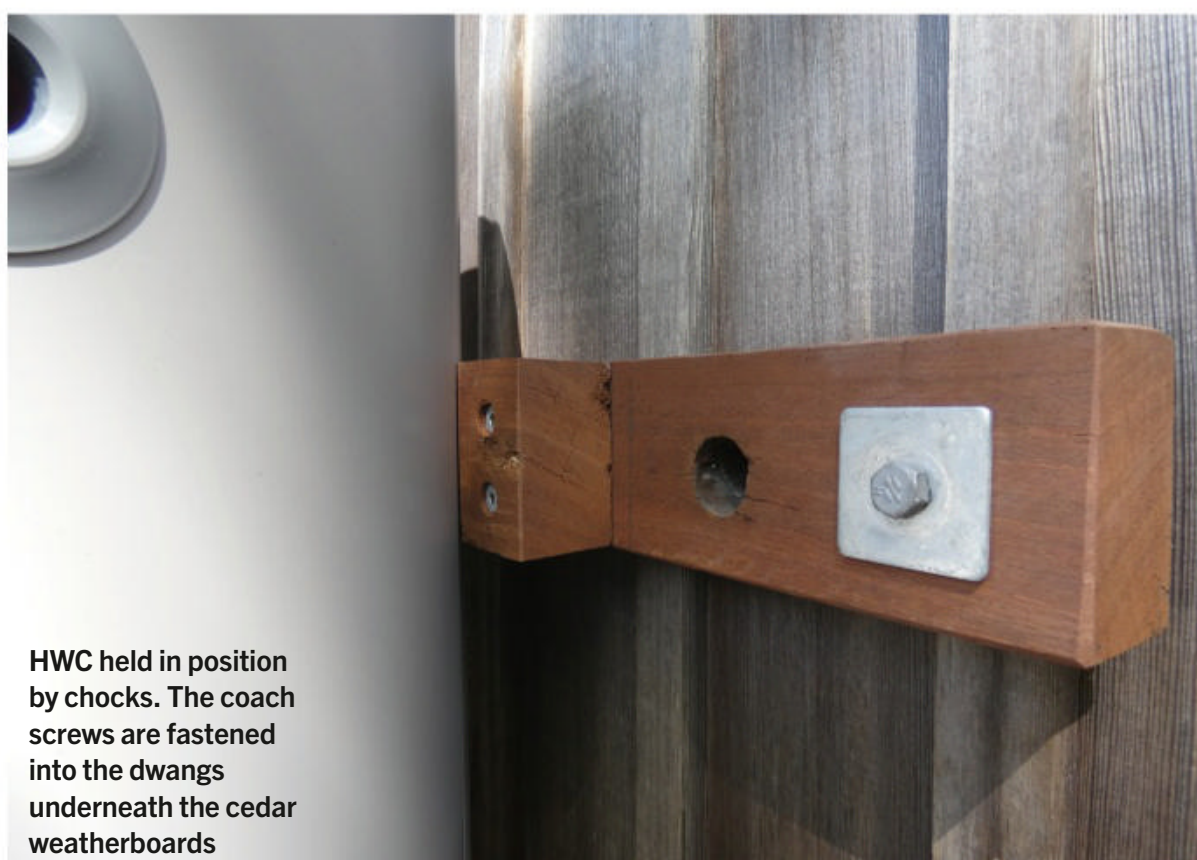
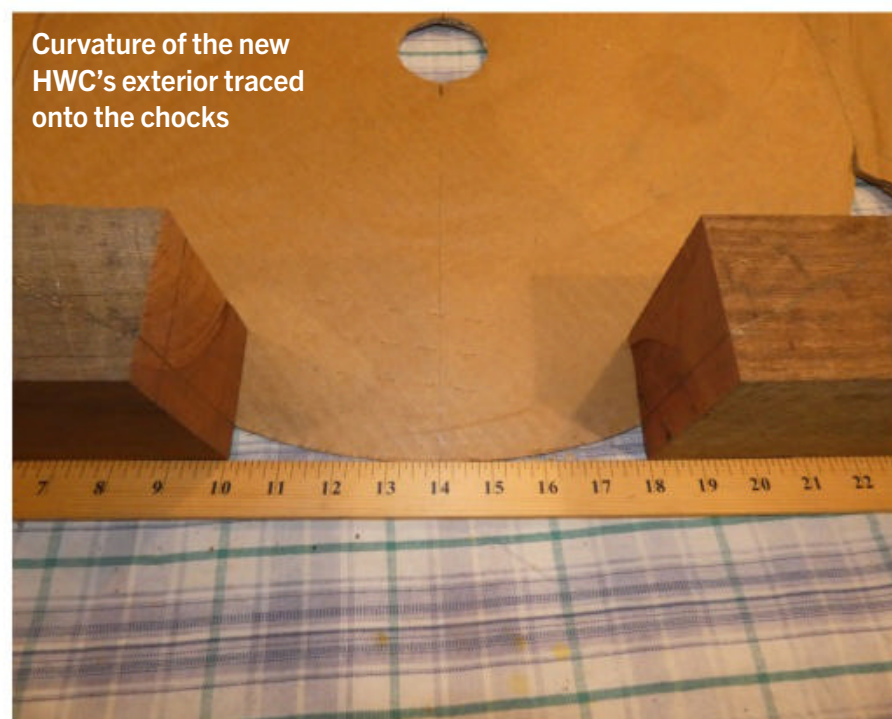
expression when examining the floor’s wet particle board. It was easy to see what they both thought: the Weetbix floor was toast.

Oh no, what now?

The assessor measured the room and drew a sketch plan. He pointed out that the damage was obviously of long duration and had been gradual,



Ensuring all is level before attaching new cylinder



which limited the amount the insurer was liable to pay. He clambered under the house and took pictures, and said that we would hear from the insurers shortly.

The plumber was certain that the leak was from the copper HWC and said that he had replaced many. He attributed the failure to the chlorine in the water. He also had an unexpected piece of bad news. Our tall and narrow cylinder was no longer manufactured, he said, and the smallest diameter cylinder available would be too wide to fit into the same position. The two-stage repair would not be possible unless the cylinder was relocated to the outside of the house. This required some thought.

Exterior HWCs are significantly more expensive and have greater heat

losses than interior cylinders. They have increased insulation, but the heat losses are perhaps double those of an interior HWC. They're also rather unsightly. On the other hand, they free up space inside the house and — this was the most persuasive argument — if they leak there is no damage to the fabric of the house. My daughter and her husband had installed one during the rebuild of their house, so we were familiar with the idea; I had, in fact, made the concrete base for their one.

A decision was made

A tankless, 'instant' hot water system, fuelled by LPG, was suggested by the plumber, as it would be significantly cheaper to install and not so liable to failure. However, we had seriously looked at LPG for cooking when we

were buying a new stove three or four years earlier and had been put off by several unattractive aspects. The potential ban on new LPG installations and the looming exhaustion of local supplies didn't make gas any more desirable.

A large exterior HWC was agreed on, the position decided, and the plumber supplied a quote.

Then another problem became apparent. HWCs are required to be restrained by three approved straps attached to the building, to prevent them from tumbling over in an earthquake and potentially crushing nearby persons. A cylinder full of water is very heavy and, because of its height, relatively easy to unbalance, so the attachment has to be reliable. Our house is clad in Western red cedar from the USA, which is a most durable timber but not very strong and the coach screws usually used to fasten the straps would, I imagine, easily pull out of it under load. I told the plumber that I would not only cast a concrete base for the cylinder but also fashion a cradle to hold it and provide anchorages for the restraining straps. I had in mind the sort of structures that safely hold water drums in position in large boats — and I had the perfect material available to use.

Ya never know when you'll need stuff

Some years before, my neighbour had replaced his early 20th ►

century front fence with a tall, very nice, recycled brick one. I had had a couple of gate posts made in the same style as the posts in his original fence, so he offered his old posts to me. They are made of the lovely Australian hardwood, jarrah. The above-ground sections were in perfect condition but 100 years in the ground had been extremely hard on the underground parts, of which little was left. One post, which had lost its turned top knob, was ripped on my Auckland-built 1960s Dyco Durasaw table saw into two 100 x 50mm boards about a metre long. These were fastened to the framing of the house wall by long galvanised steel bolts or shorter coach screws. Chocks that fitted the curvature of the cylinder were made from the jarrah offcuts — using the 14-inch bandsaw at the local MenzShed. I determined the curvature of the chocks by making a cardboard circle the same radius as the new HWC and transferring the shape of the circle's circumference to the wood. There was some scepticism from the guys at the shed as to the bandsaw's ability to cut the thick hardwood, but it had no difficulty in swiftly and accurately shaping the chocks, which were fastened with bugle-headed woodscrews to the jarrah boards. I can see I will have to find room for a bandsaw in the workshop.

What earthquakes do to bolts

I plan to attach the third restraint to two of the house's driven piles. The simplest method would be to drill holes in the wooden piles and use bolts to hold a horizontal board to which the cylinder's restraints would be fastened. Bolts through the poles in pole houses were once universal, but the huge magnitude 6.9 Loma Prieta earthquake in California in 1989 showed that these bolts would split the poles they traversed under violent shaking, causing irreparable damage — the pole would have to be replaced. I saw identical damage to local pole houses after the magnitude 6.3 Christchurch earthquake in 2011, the hefty vertical poles being split in line with the bolt hole and the pole houses then being



insurance write-offs.

The preferred method of attachment these days is steel bands that embrace the pole as, in a shake, the bands don't fatally damage the pole they are fastened to. The bands around our piles will locate a 1600mm-long galvanised hollow rectangular steel beam to which a jarrah pad and two chocks are attached. The thickness of the jarrah pad will be found by measurement between the hot water cylinder and the steel beam.

The 800mm square concrete pad was made to be about 150mm above ground level to keep the cylinder out of less serious floods. I took considerable trouble with the boxing, because the concrete had to be dead level, to ensure that the cylinder was truly vertical, so as to sit snugly against the house wall. I made the concrete in my small electric concrete mixer and the resulting slab was satisfactory without being outstanding.

Plumber time

The following week Dean, a Brisbane plumber, arrived to install the cylinder,

Chlorine

Chlorine is a very reactive element that was famously used in the trenches of WWI as the first war gas. As well as soldiers it also kills bacteria and viruses. Other elements from the same chemical family are also used as antiseptics: bromine is used in swimming pools, notably in France, and iodine is very commonly used to stop bacteria infecting wounds. Chlorine is reasonably soluble in water, and some of the dissolved chlorine reacts with water to make an acid solution. This acid would remove the, possibly protective, copper oxide layer from the inside of hot-water cylinders.

which took the entire morning.

The old cylinder was disconnected and drained, then straps were wrapped around it so it could be hoicked out of its narrow alcove and tossed disdainfully off the back deck and onto the trailer for a final journey to my broker. The new cylinder was then strapped into place against the



chocks. A kit of attachments came with the cylinder and Dean used these to connect it to the cold-water supply and to hook the outlet into the house's hot-water pipes. New Zealand regulations require that the water supply is protected against backflow from hot water cylinders so a one-way valve was installed. A pressure-release valve, venting to a soak pit Dean made, is needed to stop the cylinder exploding as its water expands as it is heated. Dean was keen to make a very tidy job of the pipework around the cylinder. The grey alkathene pipes, joined by brass junctions and hidden behind insulation, were positioned close to the cylinder in a very neat manner.

A plumber's dream

One requirement was for a section of pipe, no less than a metre in length, to connect two outlets on the cylinder. Using his manual pipe bender and his powerful biceps, Dean formed this U-shaped section from copper pipe that had been attached to the original cylinder. A crox tool was used to shape the ends of the pipe so as to form

Dehumidifier drying the bathroom floor



watertight joints. The second-hand copper pipe was quite hard, so getting the crox tool to groove its end was challenging. There are other ways of doing this, but Dean likes this method because it's traditional and because of its physicality. He also liked the house's generous underfloor space — “a plumber's dream” — although he wasn't so impressed by the numerous bumble bees that appear to have taken up residence there.

Then Alex the electrician, a friend of Dean's, arrived. Because the new cylinder was installed some distance from the position of the old one, Alex decided that new wiring to the switchboard was the most convenient option. To access the switchboard from under the house it was necessary to open up the wall cavity by cutting small holes in the interior wall lining. As the cylinder was outside, the electrical circuit needed to have a residual current device (RCD) installed as a safety measure. If we had left the cylinder in its old position, we wouldn't have needed the new wiring or the RCD.

So what had happened?

Almost immediately after the chlorination of Christchurch's water, plumbers began to see an increased number of failing copper HWCs. It was reported that the rate of failure quadrupled after chlorination.

Local manufacturers, such as

Superheat Limited, were naturally concerned, and met with officers of the CCC to discuss the failures. Superheat CEO, Trevor Edwards, says that the CCC's position was that the copper used in the failed cylinders, some relatively new, was “too thin” and “poor quality”. Trevor, who was well placed to know the true state of affairs, commissioned University of Canterbury Department of Mechanical Engineering's Professor Milo Kral to investigate the failures and supplied him with four failed HWCs from three manufacturers.

Thick copper won't help

Professor Kral found all four had identical damage in their bases. He found numerous hemispherical pits surrounded by corrosion products. Energy dispersive spectroscopy identified chlorine and iron in the corrosion products around the pits but not elsewhere in the cylinders. The unarguable conclusion was that chlorine was involved in the formation of the pits. It was probable that chlorine in the water and solid iron oxide particles in the debris at the bottom of the cylinders reacted with the cylinder's copper, forming the pits, which would continue to grow until they reached the outside of the copper. It wouldn't matter how thick the copper was, eventually the pit would grow deep enough to breach the cylinder. The iron ►

“The government enquiry concluded that sources of artesian water in many parts of the country were dangerously susceptible to contamination”

oxide particles would probably have come from the city’s old iron pipes. The actual mechanism for the corrosion of the copper by the chlorine and the iron oxide was not obvious and more investigation would be required to clarify it.

An additional feature of the failure of the HWCs is that it is more common in some areas than in others. Our area is well known for cylinder failures, perhaps because of the aged water storage tanks on the nearby Port Hills or because of the state of the area’s iron water pipes. Artesian water sources that are chlorinated seem to cause more HWC failures than surface water sources that are chlorinated; it is not clear why.

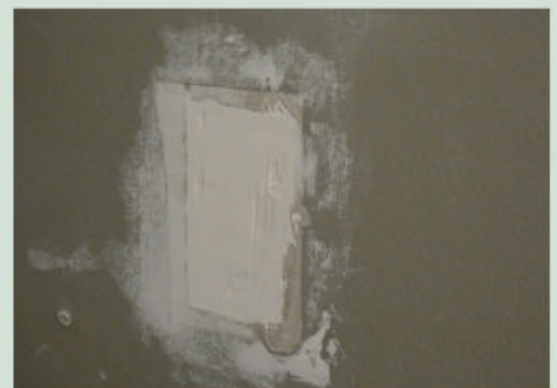
So where does this leave us?

If your water is chlorinated, and it is from an artesian supply, and there are iron pipes in the water supply network, and you have a copper HWC, then, as solids build up in the base of the cylinder, there’s a risk of hemispherical pitting leading to your copper cylinder failing. Good luck with getting the water’s chlorine removed, but if you filtered the iron oxide out of the cylinder’s cold-water supply and periodically flushed the solid debris out of your HWC in some clever way, you could probably extend the life of your copper cylinder. The presence of dissolved oxygen in water supplies, its acidity, and the temperature that the HWC gets to could all have an effect on the formation of the hemispherical pits.

Interior linings

To repair the various holes in the Gib board wall linings, I cut pieces of plasterboard just larger than the openings and made two tiny holes in the middle of these patches through which I threaded a short length of welding wire to act as a handle. I then smothered the front surface of the patches with gib-stopping compound to act as an adhesive, slid the plasterboard patches through the holes, jiggling them into position so that they sat symmetrically behind the holes, and held them in position with the welding wire wound around a small stick. Next day the patches were firmly stuck to the inside of the wall lining. The welding wire was pulled out and the cavity in front of the patch filled with more gib-stopping compound and smoothed off level with the wall’s surface with a trowel.

When the compound had dried, it was scraped smooth with the edge of the trowel and another coat of the compound applied. When this last coat had dried, the compound was finish-sanded with 120-grit abrasive paper held in a sanding board, undercoated, and painted.



All this needs investigating.

Trevor Edwards estimates that getting on for 20,000 copper HWCs have failed in Christchurch since water chlorination was started. This is obviously a very serious problem — it certainly was for our family. The insurance company, bless them, paid the maximum the policy allowed, but the difference between that and the yet-unknown final cost of reflooring the bathroom and replacing the shower etc. will inevitably be in the thousands of dollars.

During the time our HWC was being

replaced I visited a close neighbour because I noticed that his wrought-iron gate had been removed. I immediately jumped to the conclusion that it, like ours (*The Shed* 96, May–June 2021), had been stolen. Not so. It had been temporarily removed for painting. I then noticed that, in his yard, leaning against the fence, was a large HWC. It had failed and was being replaced. The same week I learned that a relative who lives on the Port Hills was having his copper HWC replaced because it had developed a leak.

Coincidence? 🏠



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**“WE CAN DO
ANYTHING,
DARL!”** — **IN THE SHED
WITH MR G**



The current members of the "A Girls Guide to Woodworking" workshop: Chrissy, Louise, Sonia, Mr G, Liz, Lou, and Tracy

GRAHAM RAE HAS BEEN REPAIRING, RESTORING, AND MAKING BESPOKE FURNITURE AS A HOBBY BUSINESS FOR THE PAST 27 YEARS, BUT NOW, AT 77, HE'S GOING FULL TIME

By Jason Burgess Photographs: Jason Burgess



Graham's mobile workstation, as well shelving, bench and drawers it as has power and air for spray gun or blower. "The best bit of kit I've built lately"

The first thing you notice when you step inside Graham's shed is how spacious it is. Fitting really, as he is a big man with a penchant for making large wooden furniture. Most of his workstations and weighty machines are on castors for portability, accessibility, and making room in the shed to turn built pieces around.

The building started life as a milking shed and separator room for the dairy farm that once occupied the property. Before Graham moved in he added windows, battened the exterior, knocked out a wall or two, and poured the concrete floors.

"Some people collect cars or have beach houses," he says. "I have my shed; it's my mental health space."

Graham's passion for timber goes beyond building furniture. From milling and drying to restoring and conserving wood, he is involved every step of the way. He also teaches a workshop, "A Girls Guide to Woodworking", for a group of local women. They not only learn the tools

"Some people collect cars or have beach houses," he says. "I have my shed; it's my mental health space."

but also gain an understanding of timber and how to get the best from it, while building their own individual pieces of furniture. Sometimes, Graham says, he wonders who is coaching whom.

"The girls are creative, passionate, and practical. They are thinking the whole time, willing to learn, and they make some really nice things."

More on the girls later.

A varied working career

Graham began his career as a motor reconditioner. He then became a diesel engineer, working on the first Commer trucks and David Brown tractors that came into the country. Later in life, he established

an insurance assessing business for heavy plant and machinery and road transport. He has run that business with his son from their home-based office for the past two decades. He is, he says, a woodworker / cabinet maker by passion.

"I have built this up myself. Everything in here has been earned in here, and I have got the best of everything."

The first thing Graham made and sold was a hutch dresser.

"It was beautiful, about 1800 wide and 1800 tall. It took me a while."

Most of his subsequent commissions have come through word of mouth. He has made his fair share of restaurant and commercial furniture, but he says the majority of clients are women looking for a special piece to fill a gap in their home.

"They come in with two or three pictures and say, 'This is what I want; this is where I want it to fit. I want a top like that, legs like this; that wide, this high'."



A Graham-built meeting table and work benches (behind), part of a fit-out commission, for the Jewellers Collective workshop



Sonia 'Princess' models her workshop wear

Working with wood

Woodworking is in Graham's blood. His grandfather emigrated to Dargaville from Scotland as a commercial builder, before going out on his own.

"He had a big machine shop, milled his own logs, made pews for churches, built houses, commercial buildings, and a lot of furniture," Graham recalls. "I was nine years old when he died but I can remember him and his factory, which was driven by a big gas engine."

"[My grandfather] had a big machine shop, milled his own logs, made pews for churches, built houses, commercial buildings, and a lot of furniture"

On a dusty shelf at the back of the shed, Graham keeps a small collection of his grandfather's self-made hand tools and chisels. His father was a carpenter / cabinet maker.

"Dad was not ambitious; he did a lot

of timber machining for a place where he worked for 27 years. His hobby was ham radio — he made his own radios — but he did pass on a few pointers."

As an apprentice Graham worked with an old friend who specialised in

furniture restoration and furniture building, and got a number of ideas from him, but reckons most of his learning came from doing up his own home.

"I rebuilt my grandfather's house — reblocked it, put in a few new ►



One of Graham's grandfather's handmade hand planes

windows, and added an extension.”

Then, when he joined his late wife on her 250-hectare sheep and beef hill-country farm, he did all the manual work there to save money.

“We rebuilt all the gates and roads, added holding pens under the woolshed, and rebuilt the sheep yards. NZ Forest Products were new in the north and were buying up some neighbouring farms. The waste was vicious in those days; they would pull down all the fences, roll them up, then just bury them. We’d go in and recover all the battens we could, and buy or rescue the gates and rails out of the old stockyards, then modify them to fit our gateways.”

Conserving resources

Some time ago, the rising cost of timber got Graham thinking about reducing waste. Conservation is a mainstay in his MO.

“The only thing we lose out of this shed is sawdust”

“The only thing we lose out of this shed is sawdust, and that usually goes on the garden or to locals who have chickens. A lot of offcuts and lower grade stuff we use for planter boxes and that sort of thing. The rest will go to firewood. It’s not hard to manage; it is just a sequence of events, and if you keep them in order then everything falls into place.”

He reckons New Zealand has an abundant supply of recyclable timber.

“The old State houses they are pulling down are full of matai, kauri, and maire floors, rimu and kauri weatherboards. The framing is totara or rimu. You can’t find heart timber like that any more. I used to hate recycling wood, but when I saw the

quality of the timber that was being wasted, I thought that it was criminal.”

As a businessman, Graham understands that the cost of demolition is a problem, particularly if it is done by hand. However, he has demolished a house or two himself and reckons that, with a skilled chainsaw operator, you can bring a house down quickly, and still spare most of the materials for reuse.

“Think of all that good roofing iron and the rafters, even the scrim board is ideal for drawer bottoms. The weatherboards — planed to remove any exterior cupping — are good for picture frames and drawer sides. The floorboards are worth a fortune. I take the weatherboards and the floorboards off with a spade. It doesn’t take long to de-nail. We have some stored and use them for the girls’ projects and firewood boxes; some gets redressed for restoration work. The only thing with recycled timber is cutting out the ►



Height 900mm
Needs to be
900 1000 side
Stool Ht = 610

Existing 1970mm
Width 750mm
Cupboards (old) 440 side
Possible 1500 length
Oak legs = 700mm high

The inspiration for 'Queenie's' breakfast bar



Another of Graham's grandfather's hand planes



Offcuts transformed into a bench block for the Jewellers Collective



The secrets to perfect drying in the container: airflow through purpose-built steel shelving and a domestic dehumidifier (left below Graham's feet)

When stacking timber, ensure the boards are filleted to stop them touching and getting mildew.

"Once the timber gets that fungal discolouration, you cannot sand or stain it out; you end up with firewood."

Mark the timber before it's machined to get a grain match after it has been through the saw.

"Even the borer matches up! Saves a lot of time at this end."

Moisture is not only a killer for timber but for sanding belts, too.

"I keep mine in the container, and save and use the old belts for working with recycled timber; if it's got paint and stuff on it, use them, because if it clogs up, you don't have to worry about it."

Clean air

"All the air that comes out of the guns, including staple guns and nail guns, is filtered to remove the moisture. With moisture, you will never get a top finish and may end up with blooming."

Keep a bottle of shellac on hand.

"It is great for touch-up jobs and colour matches on paler timbers."

Cap the ends of table tops.

"When Mother Nature goes to work on them, outside or in a sunroom, the timber expands and contracts — it *will* crack; a cap will reduce that."



Taking a moisture reading in the container

The girls and Mr G



Louise — ‘Queen Mother / Queenie’

"A Girl's Guide to Woodworking" started back in 2017. Graham had a big workshop and an interest in teaching practical skills to local women. His son knew me and about my passion for woodworking and I had girlfriends, so he introduced us to see if we could get the ball rolling.

We have had girls come and do one or two projects, but we are the long-term stayers. We are the ones who can put up with his quirky personality! And we love the camaraderie. In some ways, it's a mums debrief/counselling session. No matter what our week has been like, when we leave here we're always in a better place.

Graham's always saying, "Can you girls stop your chit-chat and do some work!" He's in control but we run the show! He gave some of us nicknames but we all call him Mr G or Mr Grumpy, depending on his attitude on the night.

Graham's skills are phenomenal. Whatever bizarre ideas we come up with, he always has a solution; there is always a work around and nothing is impossible. He says, "We can do anything, Darl!"

We always achieve what we want to achieve. I don't think there is one of us who has not been touched by his

generous nature and his obsession for project completion — he often pops around to our homes to assist with a project to ensure the finished specs are up to standard; a great friend and superstar whom we treasure.

I have run out of projects and room in my house for extra furniture. I have been interested in woodworking for years, so now I pretty much help Graham with the other girls and their projects. I love it. The confidence to use new tools and master them; take on something new and know that it is not impossible. I have my own workshop at home, and I bought myself a woodturning lathe for my 50th. Super excited to start on that.

First project?

Some kiddie stools for a fundraiser but my first big one was my bathroom vanity, which was pretty ambitious. The vanity ended up being ever so slightly larger than originally planned — but who would want to waste any of that beautiful rimu? End result? The bathroom got a full makeover to accommodate the vanity! I learned a lot.

Favourite project?

A breakfast bar made from recycled timbers salvaged from the wood pile from the tip. Old oak table legs were extended to achieve the correct height and we made the macrocarpa drawers. It is my most-used piece of furniture.



The vanity that led to a bathroom makeover



Louise's breakfast bar, the most used piece of furniture at her place



Sonia — 'Princess'

Graham portrays this image of being a big tough guy — well, he's not. There is no PC in the shed and he is really great with us — well, as long as he has got his heart pills on hand, he copes. We all take turns to bring him coffee, tea, and baking — apple crumble, carrot cake. He asks lots of questions of us, to make sure we are learning. An inspiration really.

I do paperwork for a job where there is no end in sight. With woodwork, you can see the end product. I'd been involved with light sanding and painting before but I'd never really pulled anything apart. I love it. When I have finished something, I get super excited. Friends never believe it's something I made myself.

First project?

Restoration of an old dolls' wardrobe that my pop had made me when I was five. When Graham saw what it was made from, he said, "Bin it". I said, "No, my pop's hands have touched this". Graham jokes that it is "the million-dollar cabinet" because it took me weeks to finish. I made it into a jewellery cabinet. It turned out beautifully, and I use it every day.

I have also made sliding barn doors for the pantry. My latest build was using an old Singer sewing machine. We made a new carcass and converted it into a mobile cocktail cabinet.

Biggest project?

My dining table — 2.3m long and 1700mm wide. We used cross-arm timbers from old power poles to form a crucifix through the centre. My son did the steelwork for the legs. ►



Sonia's dining table and barn door sliders



Chrissy – ‘Duchess’

This is not just about woodwork; it’s about catching up with friends, supporting each other with what’s happening in our lives — and jumping in and helping each other with projects, because some are huge and need more than two sets of hands to manoeuvre!

Graham is generous with his knowledge — and he’s not just a great craftsman; he’s a great wine connoisseur!

My biggest sense of achievement is knowing that I have crafted something from the ground up — obviously, with Graham’s help.

My first project?

A bar leaner. It’s a pretty chunky size. I didn’t think I could achieve something so big. Decking timber from an old deck for the top and macrocarpa legs from Graham. When I first came here I finished that project before everybody else had done theirs, and I had a great sense of achievement. It’s awesome; family and friends do not believe that I made that. Lots of skill!

A tricky project?

I went on to make some beautiful bedside cabinets out of oak. They are amazing — very technical. I learned heaps. I was only going to make one, but when I finished it Graham said, “What about your husband?” So I had to make another set; it took a lot of time. ►



Chrissy's bar leaner



One of a set of two bedside drawers

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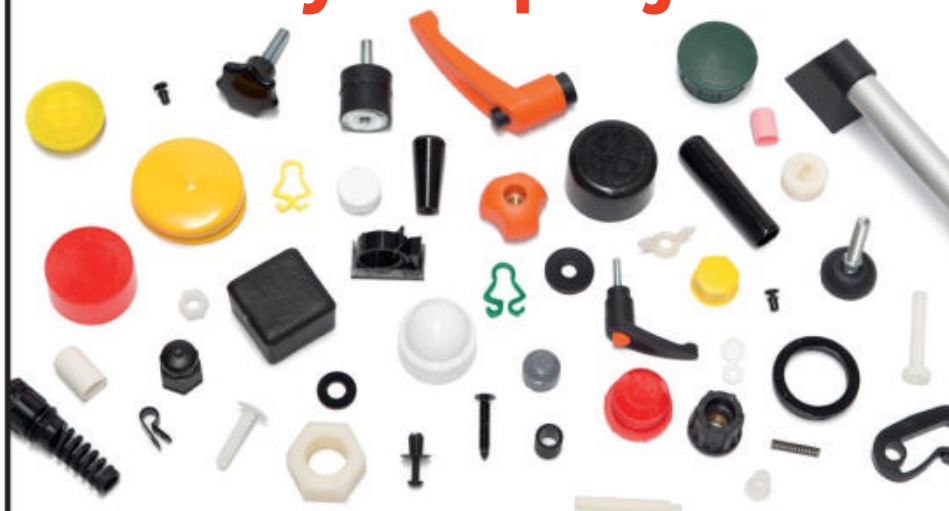
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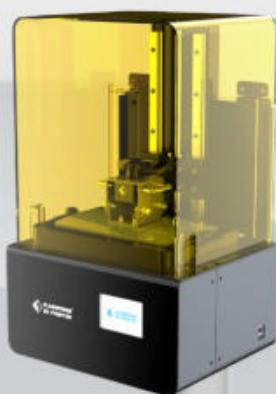


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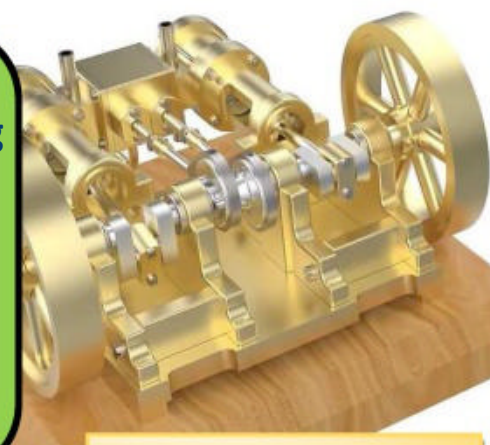
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The girls and Mr G



Liz

Graham's knowledge is exceptional. He has taught me to slow down and pay attention to details. This has a knock-on effect in my own work. I've learned new skills, which is incredibly empowering. My dream was not to have to employ a handyman for basic home maintenance. I think I have achieved that, and I've ploughed through my project list.

I have made a beautiful desk, mobile workbenches, tables, and a mobile drying rack for my book-art studio. For my home, I've made a coffee table and foot stand, and have also restored some small drawers and built a kauri case for them. I own my own drill now!

First project?

Transforming a grubby old pallet into shelves. Graham made me stay behind and finish them because he didn't want [the pallet] lying around in his shed. He thought it was in such bad condition it should have a hammer put through it! I didn't have any money at the time but I needed some shelves, and that is what I got and I was very happy with them.



Liz's drying rack for paper drying



Liz's mobile workstation and desk finished with a veneer of old shipping maps



Tracy

When I was a kid my dad was a joiner so I grew up holding planks of wood when he was sawing them in his shed. Learning from Graham reminded me of helping Dad, I think a part of me was missing that hands-on making stuff. It's not just the making, it's the finishing; you can transform something just by the amount of work you put in afterwards.

First project?

A wooden step stool. I bought [one] from a charity shop but everyone in the house was trying to steal it so I thought I'd make another one. It was a confidence thing — I thought I'd start small. It was a good one to learn the tools and the processes on — like biscuiting the wood together, using the bandsaw to cut the round corners, clamping, and sanding. That was the foundation for all my other projects.

Biggest achievement?

My dining table, which we made from scratch using kauri floorboards. Graham found them at a demolition yard. He seemed to think they were from a brothel in Auckland.

They were caked in dirt. So that was a massive job: cleaning them up and sawing off the groove because they were tongue and groove. I had to plane them so they were all smooth. You can see all the old nail holes. It took about three months to build. It's only going to get better with age.

I posted progress on social media as “woodwork spam” and had friends from all over the world commenting. Friends come around and say, “Nice table”. My son says, “My mum made that”. It's an heirloom, really. ►

Tracy's recycled kauri dining table



The wooden stool before finishing



Lou

It's really nice learning a different set of 'making' skills. I am a bookbinder and I make stuff for other people all day, making other people's ideas, so it's great to come here and make something for myself. The processes are similar, but making something that is sturdy and functional in a different way is what I really enjoy.



Lou's plan drawer trolley

First project?

A beautiful medicine cabinet made from rimu and macrocarpa. I brought in pictures, we did some measurements — actually I think Mr G did most of them — and we went from there. The projects have become more complicated as we go. I have refurbished a set of drawers, and a desk and made tables and trolleys for my bookbinding studio.

Biggest project?

A trolley with castors, to fit a set of metal plan drawers on, so I can move it around. It has beautiful joints. It took a while. You can't go out and buy a trolley for a set of plan drawers or a table for a nipping press.



A new desk for Lou's Binding Studio

► nails. That bit ends up in the firewood bin. But firewood is not a waste.”

Milling mac'

Graham admits that milling timber can be a big job. Not so long ago, farmers who wanted to clear land would get a bulldozer in and simply push trees into a hole to burn or bury them.

“It’s sacrilege, but it was about getting it done quickly. Farmers are generally more conservation conscious today.”

He oversees all the cutting, milling, and drying of the fresh timber he uses — mostly macrocarpa (*Cupressus macrocarpa* or Monterey cypress) — which is sourced from his son-in-law’s farm or his son’s friend, who has a large run-off near Dargaville.

“Macrocarpa is underrated. It’s got a good grain, is easy to use, and dries quickly. But you have to look after timber when you dry it. When I first started using macrocarpa, nobody was

interested in it. I talked to some of the old cockies who were getting it milled on their farms and they said, ‘Take your time with it, handle it properly, and you’ll get a great result.’ That’s what we do, and that’s what we get. I am really happy with it. It takes a little selective milling but as soon as it is cut we look after it.”

All the timber is milled, graded,

“Macrocarpa is underrated. It’s got a good grain, is easy to use, and dries quickly”

filleted, stacked, and air dried in an open hay barn, onsite at the farm.

“I used to cut the trees myself but I’m too old now. I get a cross-cutter in to get them down and cut to specific lengths.”

Because macrocarpa has a propensity

for splitting as it dries and ages, all the ends of the cut boards are sealed with house paint before being stacked.

The container

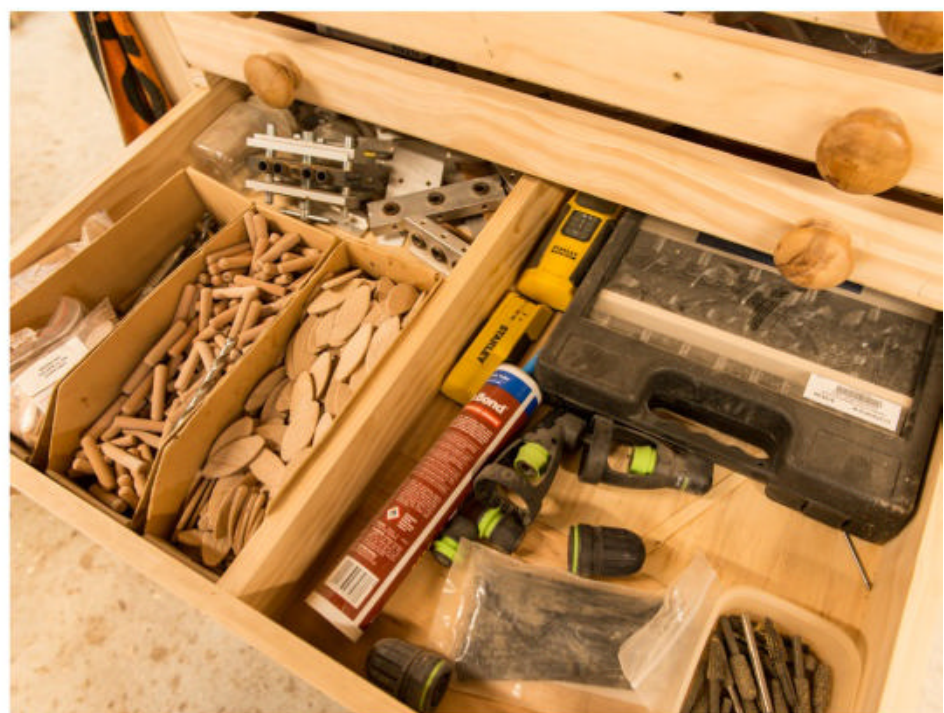
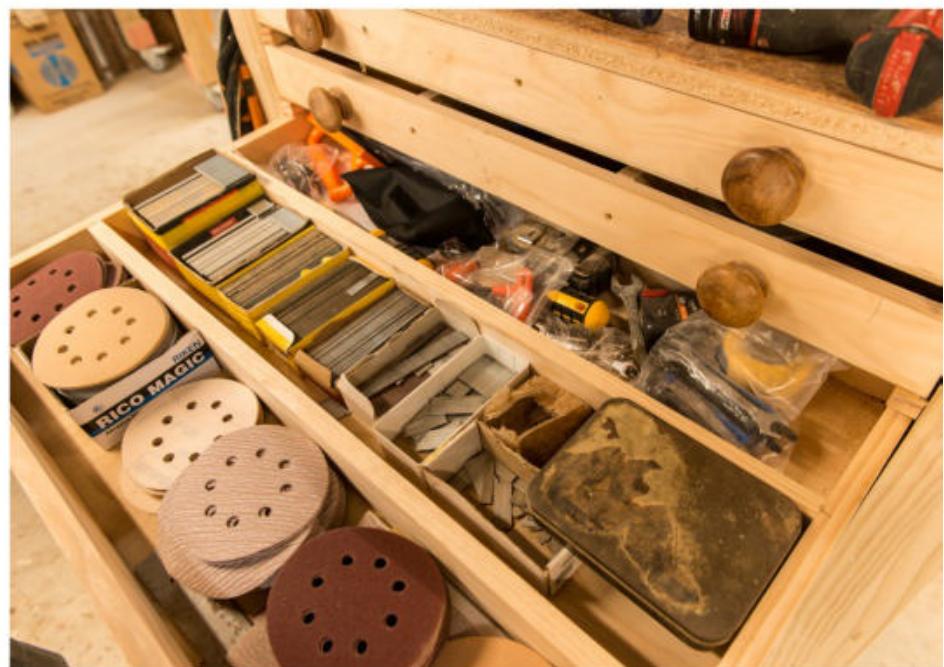
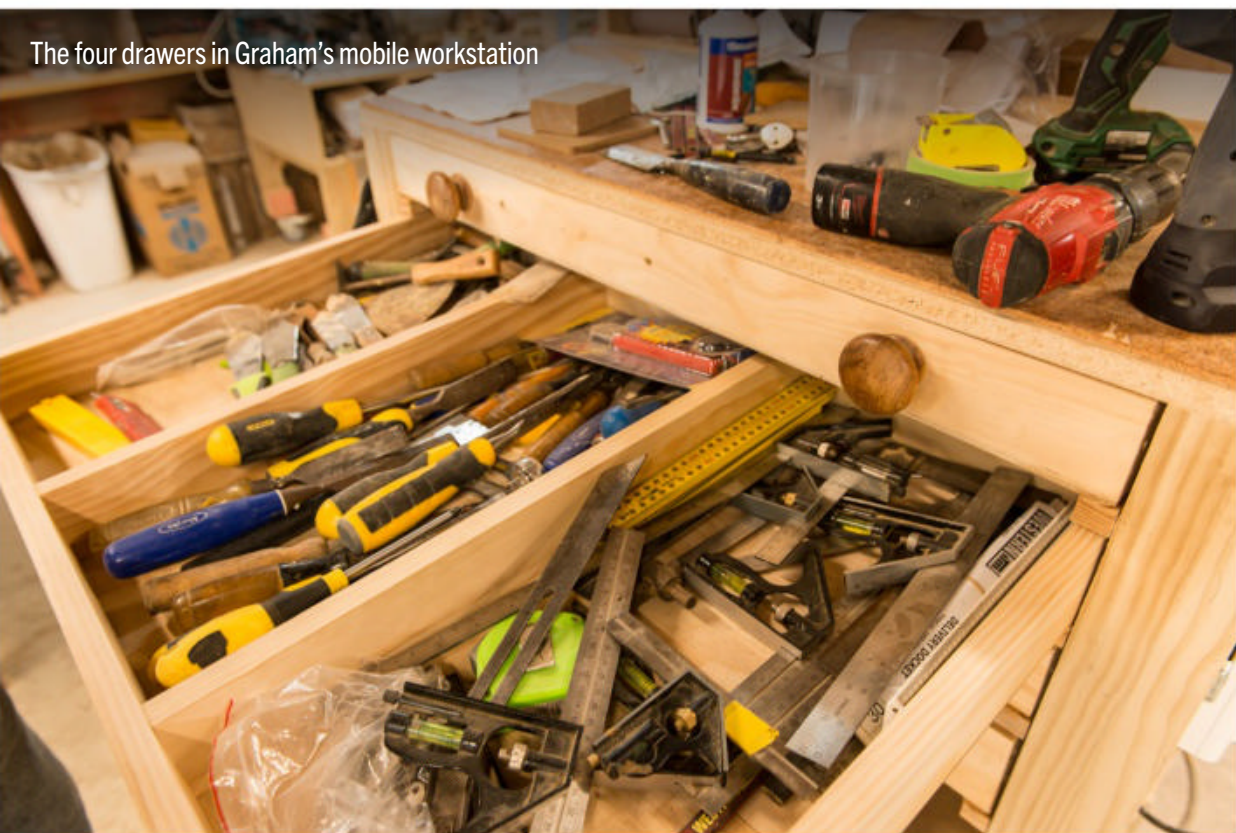
“When it’s time to bring them here, I’ll go up north and run the saw through them at 2.6m long so they fit into the container,” Graham tells us.

He has converted a six-metre-long shipping container, which sits adjacent to his shed, into a drying shed. He runs a domestic dehumidifier 24/7 in the container, to help with the drying process. The moisture is piped out into the garden.

“It was expensive to set it up. The container was brand new; I bought new steel and a friend and I made up the shelving.”

To prove how effective the container is, Graham makes a number of readings inside with his moisture meter, particularly towards the darker end. ►

The four drawers in Graham’s mobile workstation





A set of Graham-built workstations in the Jewellers Collective studio



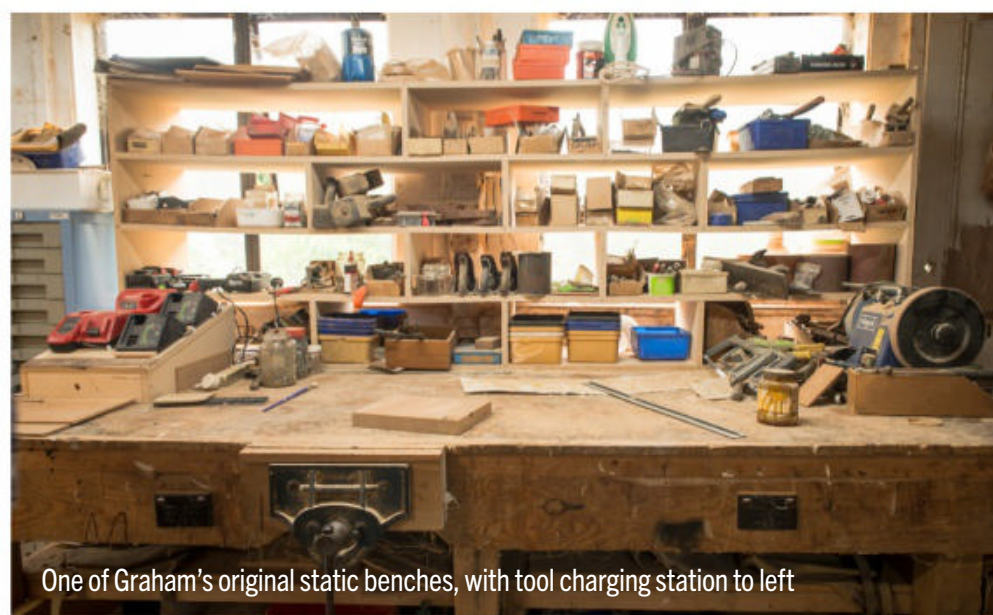
Interior of Graham's shed before class begins



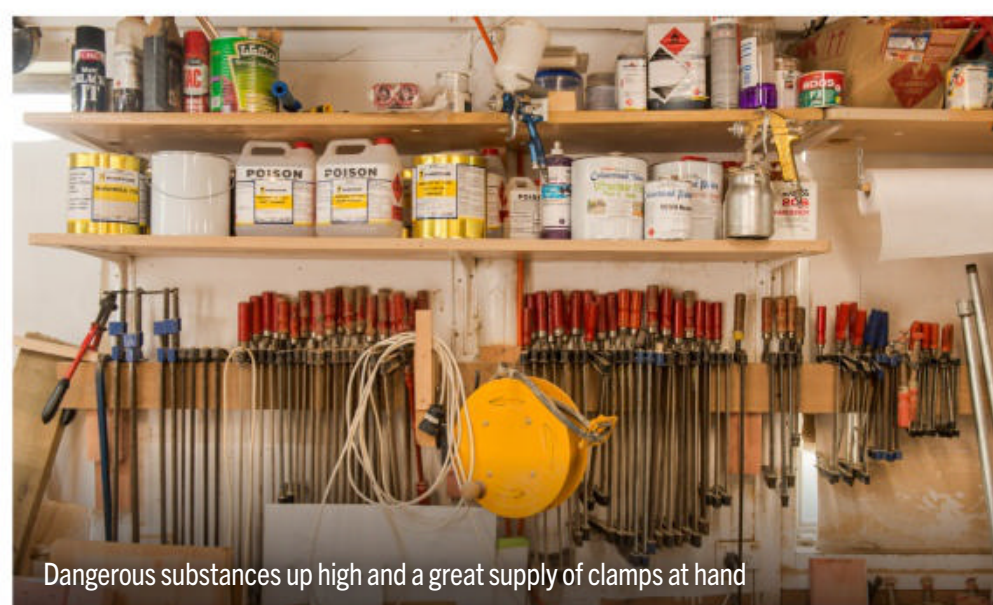
Another mobile workstation



A bottle of shellac for touch-ups



One of Graham's original static benches, with tool charging station to left



Dangerous substances up high and a great supply of clamps at hand

“The kauri is 11.8 per cent — the lowest you will get it. The standard is about 24 per cent.”

The kauri Graham is referring to is swamp kauri, which was dug up and milled 35 years ago.

“You can tell by the colour that it was a big tree. The bulk of this is for a coffee table, which matches a dining table I have already made. It all came from one log, all the same colour. We won't waste any of it. The ugly bit will be machined off, and someone will use it to stick a barometer or pictures on — some use like that.”

The kauri has been carbon-dated at 35,000–42,000 years old. When the trees were dug out they were lying from the south to the north with all the heads burned off and the stumps still on.

“At some point, there has been a

catastrophic fire on the west coast of the North Island.”

“At some point, there has been a catastrophic fire on the west coast of the North Island”

Going forward

There appears to be no stopping Graham. At the time of writing he had just knocked off a large commercial job for Jewellers Collective in Auckland: a shared workshop / workspace for jewellers of all levels. The project involved building a dozen identical, but individual, workbenches, a central table, plus workstations for

water baths, soldering, beating, and polishing. He also finished his client's kauri coffee and dining table set, and some garden drawers for himself.

Graham says the uncertainty Covid created has knocked the stuffing out of commissions but in the year ahead he is planning to run “A Girl's Guide to Woodworking” day classes as well as his night classes. Depending on numbers that could be twice a week.

“I prefer to keep the class sizes small, ideally four. Once the girls start creating, you can end up with some pretty big pieces.”

After three trips north over Christmas, Graham has restocked his drying container and — as we go to print — his newly revised website should be up and running: thewoodmaster.co.nz 📄

Bookcase

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Featuring 18 of the best projects from the last 10 years, The Best of The Shed includes all of our most popular projects. With step-by-step instructions, the 176-page book will take you through a variety of projects, including a pizza oven, a trailer, a rocking horse, and a knife.

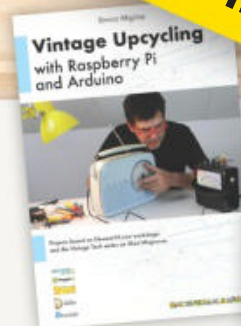
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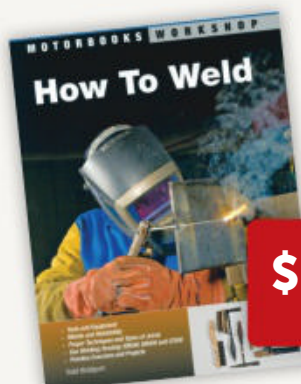
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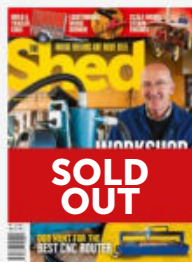
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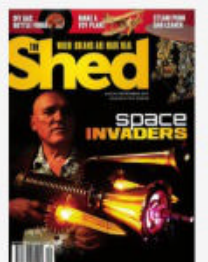
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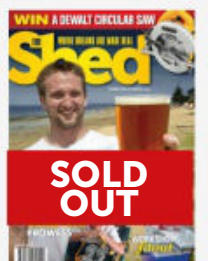
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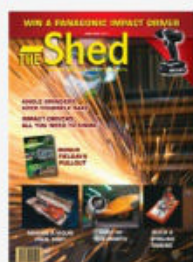
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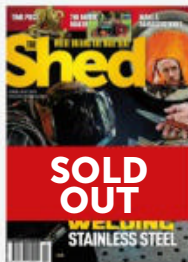
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